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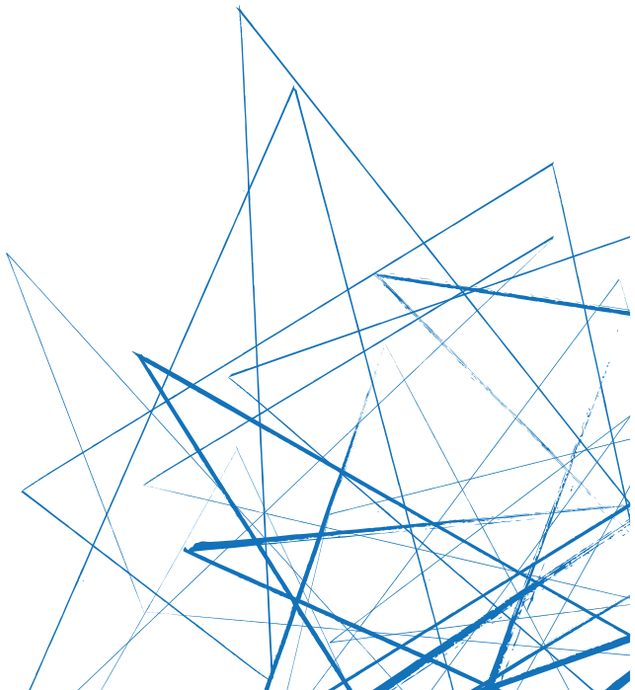
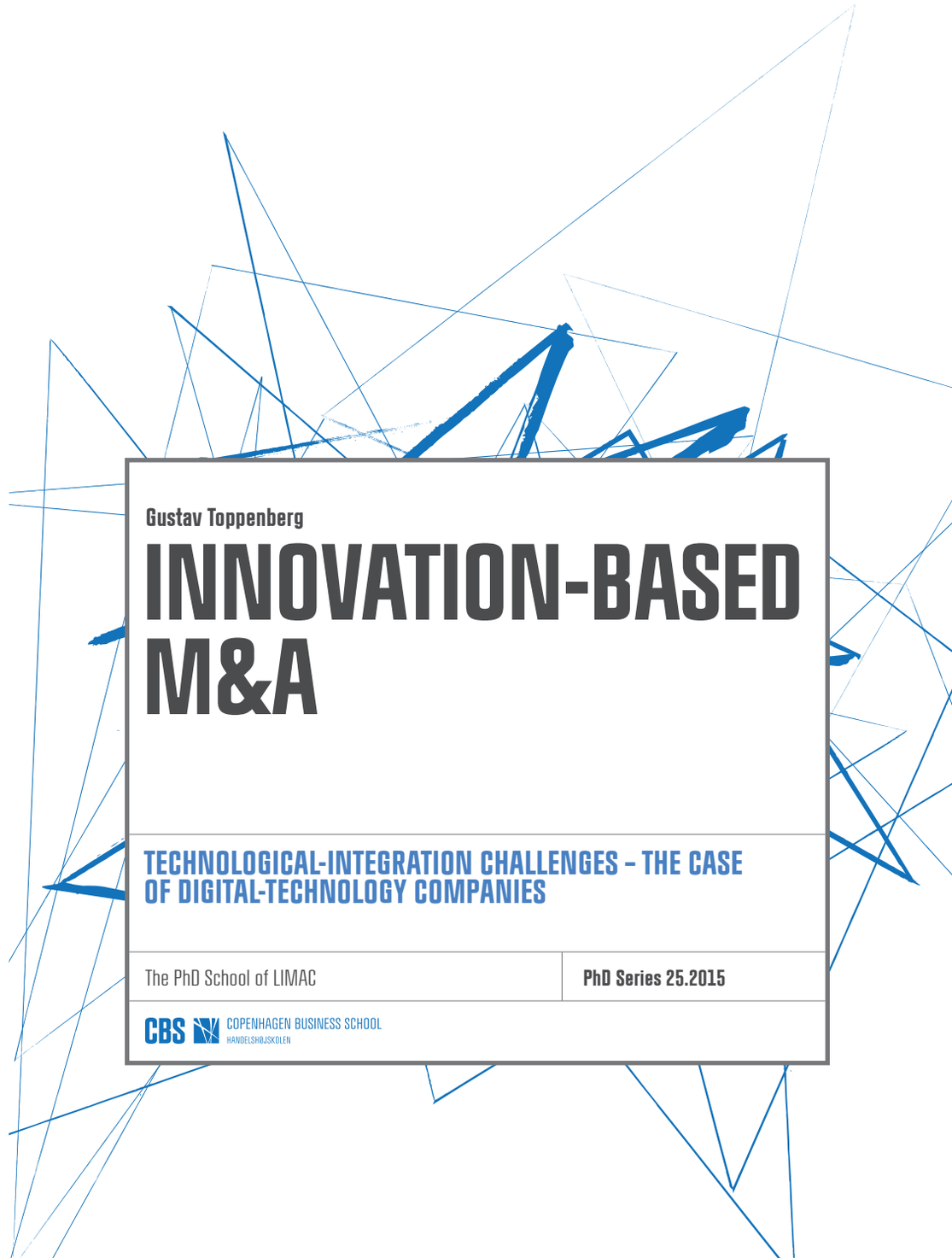


INNOVATION-BASED M&A – TECHNOLOGICAL-INTEGRATION CHALLENGES – THE CASE OF DIGITAL-TECHNOLOGY COMPANIES

PhD Series 25-2015



Gustav Toppenberg

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The PhD School of LIMAC

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HANDELSHØJSKOLEN

Innovation-based M&A – Technological-Integration Challenges – The Case of Digital-Technology Companies

Gustav Toppenberg

Supervisors:
Niels Bjørn-Andersen – Professor, Copenhagen Business School
Stefan Henningsson – Associate Professor,
Copenhagen Business School

Department of IT Management
Copenhagen Business School

Gustav Toppenberg
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FOREWORD

The choice to follow an engaged-scholarship research approach was carefully chosen early in this research project. As an employee of Cisco Systems in the Information-Technology group for several years, as head of Enterprise Architecture Operations and Governance, and as an engaged practitioner in many industry associations and interest groups, it was a natural choice for me to study the acquisition-integration challenges in this company and industry context utilizing the experience, exposure and professional network at my disposal. Insights and views on the research, based on the authors experience, has been leveraged to create as rich a description as possible in addition to providing key lessons for Cisco, the digital technology industry at large, and other large incumbent digital-technology firms. Where information is this cover manuscript is citing or referencing literature, obviously it has been sourced from there. Where information and insights are not

referenced, it is sourced from the author's intricate personal knowledge and experience of the industry in general and the case company in particular.

ABSTRACT

This research examines the technology-related integration challenges to acquisitions in digital industries and how these challenges can be managed. Historically, companies seeking to increase markets, products or customers have utilized the strategic growth process of mergers and acquisitions. Their motivation was primarily to utilize economies of scale and operational synergies to integrate acquisition targets that were similar in product, market, and customer demographics. The aim of these acquisitions was to scale the acquisition products to its own markets and customers while potentially gaining new markets and customers in the process. For companies in the digital-technology industry, the path to growth in these fast-paced markets is through the acquisition of innovation-based technologies from new and emerging companies to complement their current R&D strategies. The incumbent enterprises look for emerging

technology companies as acquisition targets in order to stay ahead of the increasingly fast technology-development lifecycle. The acquisition and integration process for these types of companies present challenges to practitioners that are very different from what has been experienced in the past and will present new research opportunities for scholars researching the related domains.

The role of technology plays a critical role not only in the operational processes of the organization but also in the products that are acquired for companies in the digital-technology industry (e.g. Apple, Oracle, IBM, Microsoft, and Cisco.) It is the ambition of this research project, through an engaged-scholarship research approach, to uncover the technology-related integration challenges to acquisitions through three research phases. First, seek an understanding of the current state of the art in the information-systems domain as it relates to the phenomenon. Second, following the engaged-

scholarship research approach, engage practitioners in dialogue on the challenges of integrating technology in digital industries through explorative focus group and key informant interviews. Third, create rich case descriptions from exemplary companies in these industries that highlight the challenges in further detail.

The general analytical lens of the thesis is to manage technology-related challenges that emerge in acquisitions of innovation-based companies in the digital-technology industry. This is investigated and analyzed via a literature survey, explorative focus groups and key-informant interviews as well as in-depth case studies over a three-year period of time. Following Gregor's taxonomy[1] of theory development, the research phases and publications follow this same taxonomy. First, a review of the current literature to uncover potential gaps and research opportunities was conducted. This was

[1] Gregor, S. (2006). The nature of theory in information systems. MIS Quarterly, 30(3), 611–642.

aimed at analyzing the situation. Second, an explorative examination of the current challenges faced by practitioners in the process of technology-related integration in addition to key-informant interviews were conducted with the purpose of explaining the phenomenon further. Third, a rich case description of one exemplar company engaged in the integration process of digital technologies was developed with the purpose of explaining and predicting. Fourth, an in-depth analysis and examination of the use of enterprise architecture as a method to sustain an acquisition-based growth strategy and extract value faster. This resulted in the design of prescriptive methods and lessons learned for practitioners with the intent to inspire action.

The thesis examines and explains the research outcomes in four scientific research publications. Each research publication reports on the conclusions and results of a specific phase of the research project. Collectively there are four

contributions to theory and four implications to practice that are summarized in this cover manuscript and the details of these contributions and implications are detailed further in the associated scientific papers.

RESUME (Danish)

Dette forskningsprojekt undersøger de teknologi-relaterede integrationsudfordringer for opkøb i digitale industrier, og hvordan disse udfordringer kan håndteres. Historisk har virksomheder, der forsøger at vokse i relation til markeder, produkter og kunder, benyttet fusioner og opkøb som strategisk vækstproces. Motivationen har primært været at udnytte economies of scale og operationelle synergier til at integrere selskaber med tilsvarende produkter, markeder og kundedemografi. Målet for denne opkøbstype har været at tilpasse og skalere opkøbsselskabets produkter til egne markeder og kunder, samt

potentielt at skaffe sig adgang til nye markeder og kunder.

For virksomheder i den digitale teknologi industri, der er præget af volatile markeder, er vejen til vækst typisk opkøb af innovationsbaserede teknologier fra nye og spirende virksomheder for at komplementere deres eksisterende R&D strategier. De etablerede virksomheder anser opkøb af de frembrusende teknologi virksomheder som en metode til at være på forkant med det tiltagende tempo for livscyklusser i teknologiudviklingen. Opkøbs- og integrationsprocessen for sådanne virksomheder har vist sig at indebære udfordringer som afviger fra forudgående praksis, hvilket angiver nye forskningsmuligheder for teoretikere i relaterede domæner.

Det teknologiske aspekt spiller en afgørende rolle, ikke kun for operationelle processer i organisationen, men også for de produkter, der opkøbes af virksomhederne i digitale teknologi

industrier (f.eks. Apple, Oracle, IBM, Microsoft og Cisco). Det er forskningsprojektets ambition, via en *engaged scholarship research* fremgangs metode, at afdække de teknologi-relaterede integrationsudfordringer gennem tre forskningsfaser. For det første søges en forståelse af det aktuelle stadie i informationssystem domænet, idet dette relaterer til fænomenet. For det andet engageres praktikere i dialog om teknologi integrationsudfordringerne i den digitale industri gennem eksplorative fokusgruppe og nøgleinformant interviews, som følger en *engaged scholarship research* fremgangs metode. For det tredje skabes omfattende case beskrivelser af virksomheder i industrien, der på detaljeret måde fremhæver udfordringerne.

Den generelle analytiske lense for afhandlingen er at håndtere teknologi-relaterede udfordringer, der udspringer fra opkøb af innovationsbaserede virksomheder i den digitale teknologi industri. Dette er undersøgt og analyseret via et

litteraturstudie, eksplorative fokusgrupper, nøgleinformant interviews, og dybdegående casestudier over en treårig tidsperiode. Researchfaserne og publikationerne heri følger Gregors taksonomi omkring teoriudvikling[2].

For det første foretages en gennemgang af nuværende litteratur for at afdække potentielle mangler and forskningsmuligheder. For det andet foretages en eksplorativ undersøgelse af de aktuelle udfordringer, der møder praktikere i teknologi-relaterede integrationsprocesser, og der gennemføres nøgleinformant interviews med det formål at forklare fænomenet yderligere. For det tredje gives en case beskrivelse af en eksemplarisk virksomhed, som er involveret i integrationsprocessen af digitale teknologier, med henblik på at forklare og forudsige. Endelig gives der forr det fjerde en dybdegående eksamination og analyse af brugen af Enterprise Architecture som

[2] Gregor, S. (2006). The nature of theory in information systems. MIS Quarterly, 30(3), 611–642.

metode til at fastholde og videreudbygge en opkøbsbaseret vækststrategi med henblik på at opnå realisering af udlede værdi hurtigere. Dette resulterede i designet af præskriptive metoder og anbefalinger til praktikere med henblik på at inspirere handling.

Afhandlingen undersøger og forklarer forskningsresultaterne i fire videnskabelige forskningspublikationer. Hver forskningspublikation rapporterer om konklusioner og resultater fra en specifik fase i forskningsprojektet.

Table of Contents

LIST OF FIGURES

LIST OF TABLES

1. PREFACE

This dissertation consists of a cover manuscript and four research papers. In writing this manuscript, my aim has been to provide a framework to facilitate understanding and discussion regarding the challenges of technological integration in the process of innovation-based mergers and acquisitions (M&A) in digital-technology industries. The intended purpose of this cover manuscript is to support the analysis and description of the encompassing topic of M&A in digital-technology industries, while the papers[3] explore different aspects within this domain. The full research papers are presented after the cover manuscript in the following order:

Paper 1: Toppenberg, G., Henningsson, S. & Yetton, P. *"Taking Stock and Looking Forward: Information Systems Integration in Mergers and Acquisitions"*, Under review for European Journal

[3] Earlier versions of papers and related papers have been presented in peer-reviewed conferences and workshops. For a full list, refer to section five.

of Information Systems (to be revised and resubmitted)

Paper 2: Toppenberg, G. *"Expanded Understanding of IS Related Challenges of Mergers & Acquisitions: Methods & Research Context",* Presented at European Conference for Information Systems 2015

Paper 3: Toppenberg, G. & Henningsson, S. *"Technological integration of acquisitions in digital industries: a case study",* to be presented at The 75th Annual Meeting of the Academy of Management

Paper 4: Henningsson, S, Toppenberg, G. & Shanks, G. *"Sustaining an acquisition-based growth strategy: The use of Enterprise Architecture at Cisco Systems"*, under review for Management Information Systems Quarterly Executive (second round)

2. ACKNOWLEDGEMENTS

Many outstanding people and organizations have been involved in the production of this doctoral dissertation. I am deeply grateful to the people that took the time to share their experiences with me and the organizations that sponsored me.

I consider myself very fortunate to have been able to undertake this research project in an environment of encouragement and support from insightful practitioners and academics. This dissertation research would not have been possible without the financial support of Cisco Systems, the mentorship of many of its M&A leaders and my immediate management team for creating the space in addition to my work obligations to conduct this research.

As I reflect back on the research process, one piece of advice comes to mind above all others. Stanford professor Raymond Levitt reminded me during the first few weeks of my PhD project that although the journey of pursuing a doctorate may at times seem like a very lonesome and isolated endeavor, it is in

fact a social effort. Rather than isolating yourself around a unique problem in the first phase of the process, hoping to emerge several years later with a unique and distinctive contribution, spend the time throwing caution to the wind and engaging in dialogue with academics and practitioners on the themes you find interesting. By exposing your thoughts and ideas to others and getting their critical review, you arrive at a problem statement that is not only interesting to you, but also relevant to the world.

In essence, conducting research is a social process. Each contribution is a small tile laid next to many others who have come before. The hope of any researcher should be to develop ones tile is such a way that it is interesting enough in its own right but also to contribute to expanding human knowledge into new areas. I am eternally grateful for this perspective and it has guided me throughout the journey.

Over the three-year span of this research project, many senior academics and fellow doctoral

students shared with me their valuable time and comments on different parts of the dissertation research. A few people must be singled out for particular thanks: my advisors Niels Bjørn-Andersen and Stefan Henningsson have been exceptional guides for me on this journey. Also, the co-authors on the dissertation publications, Phillip Yetton and Graeme Shanks, have both been excellent senior academic collaborators and mentors guiding me on the process of developing academic knowledge and theoretical contributions. I am thankful to all of them for their generosity and guidance.

Many of my academic and professional colleagues have commented on the research findings presented to them in workshops or notes published on my professional networking sites. Their feedback has been valuable in my research process, and I consider myself very fortunate to know and work with such brilliant minds. Last, but not least, I want to thank family and friends for their encouragement and patience with my long working hours and sometimes absent-mindedness when academic

challenges preoccupied me. My wife, Johanna, is the best 'constructive critic' and all-round supporter one could wish for. Without her herculean effort in managing our life and family, this dissertation work would never have been finished. I am very fortunate to have her by my side. To my daughters, Camilla and Vivienne, you were the perfect distractions from an often grueling, but also rewarding, doctoral research journey. There is not a worry in my heart or a negative thought in my mind that your smiles and laughs cannot cure.

3. INTRODUCTION

> "*By the time it's obvious you need to change, it's usually too late. Very often you have to be willing to make a big move even before most of your advisers are on board. You have to be bold. And you need a culture that lets you figure out how to win even without a blueprint. That's how we've*

always done things at Cisco." – *John Chambers, Chairman and CEO, Cisco*

This thesis investigates how companies in industries fused with digital technologies (cf. El Sawy 2003; El Sawy, Malhotra, Park, & Pavlou, 2010) (henceforth *digital industries*) can manage technological-integration challenges related to acquisition[4] as a strategy to fortify market position during technological transitions of the industries.

In digital industries, predicting and exploiting transitions in technological developments is essential to a company's ability to compete[5]. This is no less true for Cisco, a networking company based in the heart of Silicon Valley in the United States. Cisco is a blue chip stock in the technology sector and a company that impacts on major shifts in technology trends, Cisco has had its challenges coping with these market transitions over its thirty-

[4] Acquisitions vs mergers: http://pages.stern.nyu.edu/~igiddy/articles/mergers_and_acquisitions.html

[5] https://hbr.org/1985/07/how-information-gives-you-competitive-advantage

year history. When asked[6], John Chambers, the CEO of Cisco, suggested that, "*every company's future is going to depend on whether they catch the market transitions right."* Chambers went on to predict that 40 percent of the companies in the Fortune 500 list would not exist in a meaningful way in ten years unless they change dramatically. Failure to anticipate and exploit transitions in the global market can have a profound impact on a company's ability to survive.

In the same interview, Chambers identified two critical activities that enable Cisco to be successful in keeping up with technological transformation within the markets in which the company acts.

The first activity is to identify transitions. Cisco identifies these transitions in two ways: by nurturing a capability for spotting market trends and changes in customer needs and by always looking for transformations in markets adjacent to Cisco's current core markets. Monitoring activities

[6] http://www.wsj.com/articles/ciscos-john-chambers-on-the-digital-disruptions-ahead-1423540859

in adjacent markets allows the company to see the implicit connections and to learn from customers how, when and where market convergence may happen.

The second activity Chambers identified relates to the company's response to these identified transitions. When Cisco has identified a possible technological transition of significance, the company has to respond to the foreseen transition. Cisco has two main strategies to cope with technological transformation. The first coping strategy is conditioned on whether the technology shift is identified early enough. If so, Cisco attempts to develop the new technology in-house through the traditional R&D process. At Cisco, the R&D budget is approximately 15 percent of revenue which is similar to many other digital-technology companies[7]. This is complemented by what Cisco calls *Entrepreneurs in Residence*, a program that provides financial support, mentoring, and collaboration opportunities to early-stage

[7] https://hbr.org/2015/05/ciscos-ceo-on-staying-ahead-of-technology-shifts

entrepreneurs working in areas where Cisco sees potential for market shift. This program has allowed Cisco to gain insights into recent market shifts in the areas of big data analytics, cloud computing and enterprise security. The other coping strategy is acquisition. Cisco has been a prolific acquirer of companies throughout its thirty years of existence and has made over 170 acquisitions. Acquisition is a means to catch up and rapidly get access to innovative technologies and associated capabilities. Well aware that acquisitions on average fail to produce the expected value, Cisco has developed a renowned acquisition capability that helps it be more successful than the average acquirer in substantiating value from its acquisitions.

Cisco has managed several technological transitions through acquisition. The acquisition of Crescendo Communications in 1993 was one of the first acquisitions Cisco made in reaction to a market-shift signal. Chambers personally learned from customer input about a significant shift towards Fast Ethernet. Acquiring Crescendo

enabled Cisco to not only survive but to also fortify its leading market position in network equipment during this technological transition[8]. The acquisitions of Meraki in 2012 and Insieme in 2014 are more recent examples of the same strategy at Cisco. The acquisition of Meraki, a leader in Enterprise WIFI, was made due to market signals communicating a movement towards WIFI for Enterprise. Insieme, a Cisco 'spin-out' founded by members of the technical leadership at Cisco and positioned to compete in the area of software-defined networking (SDN), was made in anticipation of a new market shift towards what Cisco calls Application Centric Infrastructure.

However, Cisco has also made significant mistakes in the process of adapting to the changes forced by market transitions. For example, the $590 million acquisition of Flip in 2009, a manufacturer of a small digital camera. Cisco acquired it as part of a planned move into consumer products; a shift it anticipated would generate demand for its networking equipment. However, the timing of the

[8] https://hbr.org/2008/11/cisco-sees-the-future

release of the Apple iPhone shortly afterward held up the success of the Flip acquisition. Cisco, by Chambers's admission, didn't move quickly enough and the damage was done[9]. Shortly after, the acquisition was shut down and Cisco eventually abandoned its move into the consumer-goods market.

Cisco is not the sole company with a high reliance of acquisitions to manage technology transitions. In recent years, a group of landscape-shifting deals have received a lot of attention in the Internet media and in the business press. For example, Facebook's acquisitions of Instagram and WhatsApp, Google's acquisitions of YouTube and Motorola, eBay's acquisition of PayPal and Microsoft's acquisition of Skype. These publicly espoused acquisitions represent only the tip of the iceberg. In fact, companies such as Apple, Google, Microsoft, Facebook, Twitter, Intel, Amazon, Oracle, and Cisco all acquire a two-digit number of business units every year to access innovative

[9] http://www.businessinsider.com/cisco-ceo-john-chambers-interview-2014-7

technologies and innovative capabilities. These companies represent the general trend of many digital-technology companies looking to acquisition as a means to stay ahead of the rapid technological change and decreasing product life cycles[10]. In 2014, companies in technology-intensive industries were the targets in approximately 8,000 acquisitions, corresponding to a financial value of $7 trillion (Thomson Reuters, 2014)[11].

In the academic literature, there is a specific focus within acquisition research on the acquisition of innovative technologies and related capabilities. This is known as *technology acquisitions*. Technology acquisitions are most prominent in digital industries, but are also notable in materials, pharmaceutical and bio-technology industries (Sears & Hoetker, 2014). Typically, technology

[10] https://hbr.org/2014/11/how-smart-connected-products-are-transforming-competition

[11] With 'technology intensive industries', we refer to industries categories as 'high technology', 'telecommunication' and 'media' by Thomson-Reuter. High-technology industries alone account for approximately 3,000 deals and a deal value of 2.5tn.

acquisitions target small, entrepreneurial start-ups, but may also involve larger companies (Graebner, Eisenhardt, & Roundy, 2010). The attractiveness of technology acquisitions in digital industries rests on the competitive dynamics of these industries where firms compete extensively for innovations that create transient competitive advantages (Brown & Eisenhardt, 1997; D'Aveni, 1999; D'Aveni, Richard, & Gunther, 1994; McGrath, 2013). Acquisitions are an attractive means for innovation as internal technological-innovation activities are subject to path dependency (Cyert & March, 1963; Kogut & Zander, 1992; Nelson & Winter, 1982) and time-compression diseconomies (Dierickx & Cool, 1989) that limit internal innovation possibilities. Moreover, smaller and younger firms are frequently more innovative than large, established firms (Zenger & Lazzarini, 2004). This is, in particular, true for truly groundbreaking innovations that radically transform the industry (Balasubramanian & Lee, 2008; Sørensen & Stuart, 2000). Therefore, acquisitions have become essential tools to retain a

technological edge in digital industries (Kale, Dyer, & Singh, 2002; Leonard-Barton, 1995; McEvily, Eisenhardt, & Prescott, 2004).

The management of technology acquisitions is, however, far from simple. Problems of implementation frequently beset them, and they are, in general, prone to high failure rates (Chaudhuri & Tabrizi, 1998; Hagedoorn & Duysters, 2002; Steensma & Corley, 2000). The integration processes that are essential to actually realize possible acquisition benefits may at the same time damage the acquisition and be detrimental to acquisition performance (Chatterjee, Lubatkin, Schweiger, & Weber, 1992; Puranam, Singh, & Zollo, 2006; Graebner, 2004; Capron, 1999; Capron, Dussauge, & Mitchell, 1998). Research shows that acquisitions frequently damage targets in terms of the targets' financial performance compared to non-acquired peers (Puranam & Srikanth, 2007; Ranft & Lord, 2002). The negative effect of integration is a facet of most acquisitions, but may be particularly salient in technology acquisitions (Puranam et al., 2006;

Graebner, 2004) that require a high degree of post-deal integration in order to realize an acquisition's potential value (Puranam et al., 2006; Ranft & Lord, 2002). Hence, a critical challenge to technology acquisition is to create synergistic value through integration without damaging the target's business potential in the process (Graebner, 2004; Puranam & Shrikanth, 2007; Puranam et al., 2006).

One major, under-researched, component of acquisition integration is the technological dimension of making the acquiring and acquisition companies work as a unified whole. Within the area of information systems (IS)[12], increasing attention has been given to post-acquisition IS integration management. Post-acquisition IS integration is portrayed as one of the essential enablers for benefitting from an acquisition (Alaranta & Henningsson, 2008) and has been

[12] Britannica definition - information system, an integrated set of components for collecting, storing, and processing data and for delivering information, knowledge, and digital products. Business firms and other organizations rely on information systems to carry out and manage their operations, interact with their customers and suppliers, and compete in the marketplace.

named as the second most common reason for acquisitions not fulfilling their financial objectives (Curtis & Chanmugam, 2005). Because companies, in general, are highly dependent on their IS, the acquirer and the acquisition companies cannot start to benefit from the acquisition until post-acquisition IS integration is completed. It's estimated that between 40–65 percent of all acquisition benefits are directly dependent on post-acquisition IS integration (Sarrazin & West, 2011).

Accordingly, research on post-acquisition IS integration has focused on the challenges of post-acquisition IS integration and the capabilities required to attend to these challenges. The literature describes why acquirers adopt different IT-integration strategies to enable different acquisition benefits (Giacomazzi, Panella, Pernici, & Sansoni, 1997; Henningsson & Carlsson, 2011; Johnston & Yetton, 1996; Mehta & Hirschheim, 2007; Tanriverdi & Uysal, 2013; Wijnhoven, Spil, Stegwee, & Fa, 2006). To leverage IT-based value creation, the acquirer must have the ability to diagnose and implement a mix of IT-integration

strategies that match the characteristics of the target and the strategy to harvest the acquisition benefits (Henningsson, 2014; Tanriverdi & Uysal, 2011; Yetton, Henningsson, & Bjorn-Andersen, 2013).

However, as shown in paper 1 of this thesis, extant research on post-acquisition IS integration is largely based on studies of acquisitions in low-tech industries, such as manufacturing and finance. Following this selective industry focus, research within the post-acquisition IS-integration literature has generally focused on acquisitions driven by economies of scale and scope and not on technology-related challenges and solutions in acquisitions driven by access to innovative technologies in digital industries.

There are two primary reasons why findings about technology-related challenges and solutions derived from the study of low-tech industries cannot directly be generalized to the challenges faced by Cisco and other acquirers of innovative technologies and associated capabilities. Research on post-acquisition IS integration has concluded

that the challenge of IS integration is highly heterogeneous. That is, the tasks required to complete appropriate IS integration is contingent on the benefits of the acquisition. The IS-integration tasks in an acquisition with primary post-acquisition benefits in economies of scale are fundamentally different from the IS-integration tasks required to enable post-acquisition benefits of scope (Yetton et al., 2013). Different capabilities are required for successful IS integration in the two acquisitions (Ranft & Lord, 2002).

Acquisition literature describes technology acquisitions driven by the need to rapidly access technological innovation as presenting distinct integration challenges compared to acquisitions driven by economies of scale and scope (Ahuja & Katilla, 2001). One can also suspect that the IS-integration challenges will be different in these acquisitions, and the IS-integration capabilities required to address these challenges to be distinct.

Secondly, digital technology has a fundamentally different role in digital industries when compared

to industries such as manufacturing. In digital industries, technology assumes not only a supporting role in operations, but is also part of what is being produced. In the case of Cisco, a majority of its acquisitions have been motivated by the acquisition of technologies, which will become part of their product portfolio. Examples include WebEx, a web-conferencing product offered to Cisco users as a service through a consumption business model. This acquisition presents traditional challenges for the IS-integration team. For example, the integration team needs to ensure a software-subscription billing system is put in place or scaled from the acquisition. At the same time, the IS integration is also responsible for integrating the web-conferencing offering into the existing suite of collaboration solutions offered to Cisco's customers. At present, there is no literature in the IS domain, or elsewhere, that addresses this type of technology-integration challenge in the post-integration of acquisitions.

Against this backdrop, the knowledge domain addressed in this thesis is presented in Figure 1.

The focal area of this thesis is the technological integration of acquisitions in digital industries. I use the term technological integration, rather than IT or IS integration, to convey an initial assumption that the technology-related challenges are not limited to the integration of IS in order to support corporate operations. IT also includes technological challenges in the offering dimension of the acquirer and acquisition companies. As shown in Figure 1, this thesis is rooted in two broad knowledge domains. As an initial point of reference, this thesis uses the general literature on acquisition integration (e.g. Birkinshaw, Bresman, & Håkanson, 2000; Datta, 1991) and, in particular, extant literature on post-acquisition IS integration (Johnston & Yetton, 1996; Giacomazzi et al., 1997; Robbins & Stylianou, 1999; Weber & Pliskin, 1996). Then, from the industry dynamics of digital industries, described through concepts such as innovation-based competition (Lenfle & Midler, 2001) and transient advantages[13], this thesis zooms in on the specific challenges of technology acquisitions

[13] https://hbr.org/2013/06/transient-advantage

(Puranam et al, 2006; Graebner & Eisenhardt, 2010).

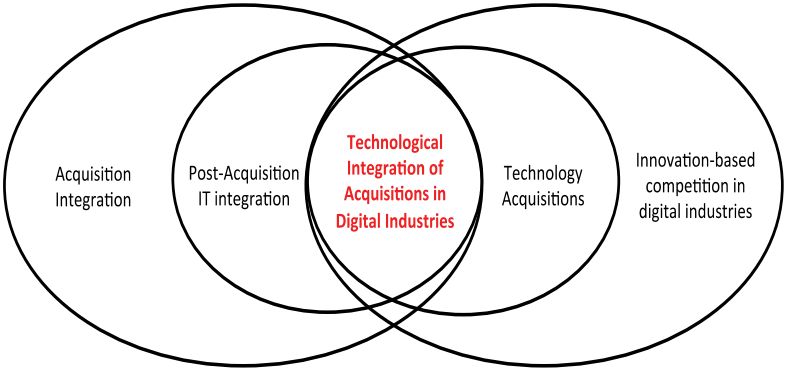

Figure 1. Knowledge domains and thesis

The goal of this research project is to undertake the task of addressing these problems through an engaged-research approach (Van de Ven, 2007) in the context of US technology companies with Cisco as the primary case company. Seeking rich descriptions of the cases detailed above through direct observation and documentation as well as through an understanding of the generalizability and pervasiveness of this issue throughout the industry, acquisition key-informant experts, and the

acquisition team at Cisco will be used as sources for case content and insights. This dissertation looks to improve our understanding of how companies in the digital-technology industry acquire and integrate technology innovation in order to make contributions to research as well as to practice.

3.1 Overarching Research Question and Central Argument

The overarching research question bridging this research was developed through a reflective and inductive learning process where practical experiences, research findings and theoretical insights have shaped our understanding of technology acquisitions and the associated technical-integration challenges. The overarching research question spanning the four research papers and this cover manuscript is as follows:

Research question: What are the technology-related integration challenges to acquisitions in digital industries and how can these challenges be managed?

To answer this overarching research question, the following sub-questions span the four research papers:

Sub-question #1: What is the current state of the literature on information systems in acquisitions?

Answering this question will ground the research project in the current state of the literature and position it in contrast and comparison to the other streams of literature within the IS domain. The goal of asking this question is to understand how the phenomenon has been investigated, which research methods have been employed, which theoretical frameworks and lenses have been used, which parts of the acquisition lifecycle have been studied, and whether they were researched from a purely technological perspective or from a business-and-technology-alignment perspective.

Sub-question #2: What firm-level acquisition integration issues exist in digital-technology companies that can motivate an extension of the research agenda for technology-integration issues?

Answering this question will allow the researcher to focus on one type of industry to further understand what challenges need to be overcome in order to successfully acquire and integrate digital technologies in this type of setting. Rather than starting with challenges that appear as symptoms, those that are faced by information systems and technology practitioners, the goal is to first acquire a deep understanding of the firm-level challenges and then trace them back to those faced by information systems and technology practitioners.

Sub-question #3: How is technological integration realized in digital-platform acquisitions?

Companies competing within the digital industry are often competing as platform organizations with common technology architecture. Leaders in these market are portrayed as "platform leaders" (Gawer & Cusumano, 2002) or "keystone firms" (Iansiti & Levien, 2004), and they are typically prolific serial-technology acquirers. The goal of answering this question is to explore how the dynamics of platform markets influence the way these serial

acquirers manage the technological-integration process to realize value.

Sub-question #4: How can challenges as a result of technological-innovation acquisitions be managed to sustain a growth-by-acquisition program?

Answering this question will help to connect the integral capability of a majority of IS teams which are known for their ability to organize and structure strategic plans in the IS department. We believe an enterprise architecture (EA)[14] capability provides the organizing logic for an organization's business processes and associated information systems. This ensures there is an alignment between the business and IT strategies (Ross, Weill, & Robertson, 2006). Therefore, it is an interesting opportunity to investigate if EA can contribute to a company's ability to capture value faster and contribute to its ability to sustain its growth strategy.

[14] http://cisr.mit.edu/research/research-overview/classic-topics/enterprise-architecture/

The focus of these four research papers and this cover manuscript is on the central argument discussed earlier in the introduction. It can be summarized by the following three core themes:

Theme 1: Based on current literature on IS in the acquisition domain, there are two gaps in context (a need for new industries to be investigated and researched) and the method of analysis (a need to focus on case studies and empirical inquiry).

Theme 2: In the digital industry, acquisitions are frequently pursued and motivated by a need to innovate at a rapid pace to compete in a fast-growing market.

Theme 3: For companies in the digital-industry domain, there is a significant difference in the challenges that come with technological integration of products compared to the challenges from integrating processes.

Therefore, there is a need to complement the current body of knowledge with new theories for researchers and with recommendations for practice

to help CIOs and IT leaders manage these types of integration efforts more effectively.

3.2 Structure of Cover Manuscript

This dissertation consists of the four peer-reviewed conference and journal publications in the Appendix and this cover manuscript. Chapter 2 provides grounding in the background and motivation for the research project before proceeding into the details of the research project.

Chapter 3 summarizes the theoretical background of the research in the IS literature. This is aimed at giving an overview of the theoretical elements that have been used to inspire and shape the research in the four dissertation publications and the conclusions drawn from the case studies of companies within the digital-technology industry. The primary focus is on multi-national companies based in the United States.

In the research process, selected theories about acquisition and the challenges found in IS integration, as well as the emerging theory about

technological integration in platform companies for this new phenomenon, were used to get a preliminary understanding of the field of studies. These were seed categories (Miles & Huberman, 1994) used prior to the data collection and analysis in the individual case studies.

Chapter 4 details the philosophical underpinnings of the research and the research process. Chapter 5 provides a short summary of each of the four publications and serves as an introduction to the full publications in the Appendix. This is followed by a summary of the overall contribution of this study to research and practice. Chapter 6 provides a brief discussion on the overall research project. Finally, Chapter 7 concludes with the limitations of the research and outlines an agenda for future research topics on the issues of technological integration in technology acquisitions.

3.3 Key Concepts

The following section is meant to provide clarity to the reader on some of the key concepts and terms used in this cover manuscript and the research

publications. The intent throughout the entirety of this research project has been to utilize a consistent set of terms and concepts which are accepted for use in both academic and practice. Over the past three years, the authors understanding of these terms and concepts has evolved and retrospectively there are slight deviations through the research publications of some of these terms and their use. However, with the following definitions of the terms and concepts, the reader will have a current representation of the terms rooted in academic literature. Additional terms are used throughout the cover manuscript and specific definitions are provided as the concepts emerge.

Mergers and Acquisitions (M&A): Merger is the combination of two or more companies to create a new entity or formation of a holding company (Jemison & Sitkin, 1986; European Central Bank, 2000; Gaughan, 2002; Jagersma, 2005). An acquisition is the purchase of shares or assets from another company in order to achieve a managerial influence (European Central Bank, 2000; Chen &

Findlay, 2003). This process is not necessarily by mutual agreement (Jagersma, 2005).

Merger: Mergers are commonly referred to as either 'merger by absorption' or 'merger by establishment' (Chen & Findlay, 2003; Nakamura, 2005). Merger by absorption occurs when one company buys all the stock of one or more companies (i.e., absorbing) and the absorbed companies cease to exist. Merger by establishment refers to the case where two or more firms are merged into a newly created company and the combining firms in the merger are dissolved (Chen & Findlay, 2003). According to Nakamura (2005), merger by absorption could be considered as a de facto acquisition. The term 'consolidation' could also be used to imply a merger by establishment (Gaughan, 2002).

Acquisition: In an acquisition, the acquiring company may seek to acquire a significant share of stocks or assets of the target company. Consequently, there are two forms of acquisitions: assets acquisitions and share acquisitions (Chen &

Findlay, 2003). An asset acquisition occurs when a company purchases all or part of the target company's assets and the target remains as a legal entity after the transaction; whereas, in a share acquisition, a company buys a certain share of stock in the target company in order to influence the management of the target company (Chen & Findlay, 2003; Nakamura, 2005).

Acquisition Integration: When two previously separate, legal, and autonomous organizations come together under a common corporate umbrella, the result is a joint organization in which value creation depends on the management of interdependencies through the facilitation of firm interactions and the development of mechanisms promoting stability (Borys & Jemison, 1989). Acquisitions are a process of joining two companies in which integration is the means by which coordination and system control across these entities are achieved. Integration involves actions taken to secure the efficient and effective direction of organizational activities and resources toward the accomplishment of some set of common

organizational goals (Pablo, 1994). Integration can be defined as making changes in the functional activity arrangements, the organizational structures and systems, and the cultures of the combining organizations to facilitate their consolidation into a functioning whole. Integration may involve a complex, interactive, mutual adjustment process between the two organizations, but change is frequently one-sided, occurring primarily within the acquired organization (Buono & Bowditch, 1989; Datta, 1991; Hambrick & Cannella, 1993; Shanley & Correa, 1992).

4. BACKGROUND

> "*You grow old, you slow down, and you die. That is, unless you can inject some fresh blood. After watching the last generation of tech giants wither or stagnate, today's juggernauts are relying on acquisitions to keep them young and relevant.*[15]" - *Josh Constine, TechCrunch*

[15] http://techcrunch.com/2014/02/25/the-age-of-acquisitions/

The following chapter describes the research context in more detail and gives the reader an understanding of the market dynamics, complexities, and opportunities that exist within the research context of the thesis. The first section of this chapter provides a description of the dynamics of digital industries and looks at the role that technology acquisitions play. The second section specifically describes the acquisition-integration process within Cisco.

4.1 Dynamics of Digital Industries and the Role of Technology Acquisitions

In the digital-technology industry, many companies are feeling competitive pressures but are simultaneously enjoying higher than average profit margins and therefore have the cash available to pursue growth by acquisition. They commonly pursue this strategy through the practice of buying another technology company and integrating the bought business fully into its own business models and operations.

A concept that has been true for several decades as technology continues to play an increasingly more strategic role for enterprises is that the continuous evolution of emerging technology is prompting many companies to expand beyond their core business in an attempt to capitalize on these new trends. One of the ways companies in the high-technology industry stay abreast of emerging new technologies that could potentially threaten and disrupt its markets is through the acquisition of small emerging companies with a promising technology or that it perceived as an eventual threat (Zahra, Sapienza, & Davidsson, 1996).

Table 1 is a summary of some significant market transitions in the technology industry and some of its victims.

Market Transitions	**Impacted companies**	**Reasons for missing the transition**
Mainframe computers to minicomputers	International Business Machines (IBM)	Lack of input from customers – arrogance

Minicomputers to Personal Computers (PCs)	Wang	Lack of focus on software and applications
Voice over Internet Protocol (VoIP)	Alcatel, Lucent, Nortel Microsoft	Lack of understanding regarding the investment in new innovation
Personal Computers (PCs) to Tablet and Smartphone Devices	Intel	Lack of understanding regarding the new uses of computers in changing form factors
Software Defined Networking (SDN) / Application Centric Infrastructure (ACI)	Juniper, HP	Lack of understanding regarding the centralization of infrastructure at the application level

Table 1. Significant market transitions in the digital-technology industries

A similar problem that occurred across all of these market transitions is that their managers were stuck in a mindset of the current and were not aware of

shifts in the market, shifts in customers' demands or the emergence of new competitors.

Characteristics and Strategic Dynamics of Digital Industries

The digital-technology industry is faced with an ongoing reconfiguration of its ecosystem along with the constant departure of established incumbents and the emergence of new disruptive players. The industry is faced with a number of forces, both from within the industry and from without, that are blurring clearly delineated market boundaries. Because of these market pressures, acquisitions are becoming an increasingly more common way for technology companies to execute their growth strategies as well as address market and shareholder demands for product and service innovation[16].

M&A is viewed by many technology companies as a key to continuous business transformation and is brought on by market pressures to continue to

[16] Ten ways to create shareholder value - https://hbr.org/2006/09/ten-ways-to-create-shareholder-value.

innovate and to broaden their offerings to existing, new, or emerging groups of customers[17]. The M&A practice, as part of a robust innovation-management process employed by many technology companies, is being used to drive broader business transformation. Many companies realize that they can no longer rest on the laurels of their historic competitive advantages but must move towards the development of transient advantages and continuously launch new strategic initiatives (McGrath, 2013). As a result, companies are forced to complement their innovation program with new growth strategies for which the pace can be more easily achieved through acquisition than by internal development. These companies are moving beyond their core business models to new emerging business models (see Table 2 for details.)

[17] The M&A strategies of the top 10 Technology companies - http://www.techrepublic.com/article/the-m-a-strategies-of-the-top-10-tech-companies/

Core Business Model	Emerging Business Model	Illustrative Example
Hardware Manufacturer	Infrastructure-as-a-Service (IaaS) Managed Service Provide (MSP) Software-defined Networking (SDN)	Cisco, Dell, VMware
Software Publisher	Software-as-a-Service (SaaS) provider	Microsoft, Intuit
Communications/Infrastructure Provider	Managed Service Provider (MSP)	British Telecom, Rackspace
Consumer Electronics Producer	Content and Service Provider	Apple, Sony
IT-Enabled Company	Cloud Service Provider	Amazon (IaaS, PaaS) McKesson (SaaS, PaaS)

Table 2. Core and emerging business models

In recent years, these companies have realized that to stay in front of marketplace demands and drive future growth, they must move beyond the tried-

and-true acquisition of the traditional core with its adjacent markets and products and seek to acquire and integrate new business models that are radically different[18]. The success of these types of acquisitions depends largely on the ability of the M&A team to integrate the disruptive business models into their existing operational structure.

Several trends have emerged over the past ten years where a convergence of hardware, software, and services is the catalyst for technology companies to innovate their offerings to their current, new, and potential customers. One such example is the software-defined industrialization of hardware. As it becomes increasingly more difficult to generate a competitive advantage building hardware, software continues to bring intelligence to bear by automating tasks, increasing technological capabilities and democratizing complex technology processes. This is a trend that is forcing incumbent hardware manufacturers to rethink their innovation strategies and move their focus to software and

[18] http://www.bain.com/publications/articles/mobile-internet-for-growth-project-report-phase-1.aspx

services, disrupting current traditional market boundaries and bringing about hybridized organizations that play across multiple technological sub-industries. The need to get these offerings to market fast is forcing these companies to acquire and integrate companies to complement their ongoing innovation-management process. This strategy necessitates the need for an innovation-based acquisition strategy which will pursue new innovative digital technologies, bringing about the need to make changes to the integration processes to ensure the value of the acquisition and the target-state of the enterprise is producing the expected value for the merger companies.

Innovation-Based M&A as a Strategy for Growth

The digital-technology industry has a long history of using M&A as a tool to drive revenue and market-share growth. After a recession-induced lag in M&A activity during 2008 and 2009, continued market stabilization in 2010 led digital-technology companies to leverage their financial strength to pursue large acquisitions and to increase the total

value of M&A deals, despite recovering market valuations. Global M&A activity in 2010 increased 9.9 percent to $149.2 billion from $135.7 billion in 2009[19]. The U.S. M&A digital-technology sector has shown an even more dramatic recovery.

Between 2010 and 2015, M&A in the software sector has been particularly active, recording four of the top ten deals since 2000. Acquirers continue to pursue software acquisitions in high-growth markets such as security, cloud computing and business analytics (BA). SAP's acquisition of Sybase strengthens its ability to supply BA solutions. IBM continues to emphasize BA with its Netezza[20] and Clarity[21] acquisitions being the most notable in 2010. Advanced analytics is expected to lead the next phase of growth in the BA market. Storage has been another active sector during this time as strategic buyers have shored up their

[19] Price Waterhouse Coopers (PwC) - http://www.pwc.com/us/en/transaction-services/publications/technology-deals-insights.jhtml

[20] IBM News Room - IBM to Acquire Netezza - http://www-03.ibm.com/press/us/en/pressrelease/32514.wss

[21] IBM News Room - IBM to Acquire Clarity - http://www-03.ibm.com/press/us/en/pressrelease/32795.wss

innovation portfolios related to cloud-computing infrastructure. As an example, EMC's acquisition of Isilon[22] was the largest deal; however, HP/3PAR and Dell/CommVault were also notable.

Painting the technology industry with a broad brush, the subsectors are experiencing different trends. For chip manufacturers, some M&A activity is centered on consolidation with vertical acquisitions to obtain greater scale and efficiencies. Other sectors are seeing diversification plays as companies buy assets that may be completely different from their historical business models in order to leverage M&A as a method to complement their innovation strategies for growth. Recent examples include Intel's acquisition of cyber security company McAfee[23] for $7.68 billion, which was completed in the first quarter of 2011; Google's purchase of Motorola Mobility[24] for

[22] EMC News Room – EMC to Acquire Isilon - http://www.emc.com/about/news/press/2010/20101115-01.htm

[23] Intel News Room - http://www.mcafee.com/us/about/intel-mcafee.aspx

[24] Facts about Google's acquisition of Motorola - http://www.google.com/press/motorola/

$12.5 billion; HP's purchase of British enterprise software company Autonomy[25] for $10.2 billion; and Microsoft's purchase of web-video-conferencing service Skype Technologies[26] in an all-cash $8.5 billion deal.

Technology companies are starting to live the reality they dreamed of in the late 1990s—converging business models and technology crossovers. Recent deals reflect a considerable blurring of the lines between technology, media, and telecom industries. Certain companies are moving into each other's space and making acquisitions to support trends such as the accelerating convergence of hardware and software, the increasing need for professional services for complex offerings, the solutions-centricity requirements for go-to-market (GTM) and development collaborations, the emerging cloud delivery models on delivery and commercial

[25] HP acquirers controlling stake in Autonomy Corporation plc - http://www8.hp.com/us/en/hp-news/press-release.html?id=1373462#.VZlupUZ6Cuk

[26] "Microsoft to acquire Skype Technologies" - about.skype.com/press/2011/05/microsoft_to_acquire_skype.html

arrangements, the industry value shifts to mobility and application-centric offerings and the "consumerization" of technology offerings (Deloitte, 2015).

Because competition is reconfiguring so fast, it is neither feasible nor advisable for a technology company to lock into a single growth strategy that is refreshed every six or twelve months. The M&A strategy cycle should be faster, shorter and include multiple scenarios that may play out in the marketplace; specifically, what actions competitors might take and the company's responses to those actions which may include acquiring an organization with a different business model.

The Challenges of Acquiring and Integrating Digital Technologies

Acquiring, integrating and subsequently operating an innovation-based acquisition with different product offerings and business processes will likely generate challenges at multiple levels of the organization, most of which these technology companies and M&A teams will have not seen

previously. If successful, however, these companies can leverage the value generated by using the drivers for a particular deal with a focus on driving value from downstream activities. These dynamics require a thoughtful approach to integration to retain the specific capabilities that made the company work in the first place.

Some deal teams do not spend enough time upfront thinking about the end state of a newly integrated company and the operational challenges that may emerge. For example, Company A is a hardware manufacturer and its backbone is based on warehouse shipments and immediate invoicing and payment. It acquires Company B, a software developer that generates revenue over time via a subscription model. The combined entity now has two sets of sales, production, and billing cycles as well as different accounting and taxation requirements. How does the company integrate and operate these two models?

Assimilation is no longer the de facto integration model for digital-technology-acquisition

transactions when different business models are involved. Executive leadership should explore the full spectrum of integration options at all levels of the operating model. An acquired company could be folded completely into the larger organization; it might form a new division or line of business under the corporate umbrella; or it could operate as an independent brand. For example, Skype became a new business division within Microsoft, and Skype CEO Tony Bates reports directly to Microsoft CEO Steve Ballmer. How the combined company will operate and execute to achieve M&A value creation and synergy goals should drive the integration process.

Positioning to Create and Exploit M&A Opportunities

Technology companies need to consider how they can more effectively transact and leverage M&A opportunities that may require them to incorporate new or different business models. The executives need to pay attention to the following areas in order

to exploit M&A opportunities related to innovation-based acquisitions[27]:

- **Focus on product integration:** Identify the value drivers for a particular deal during the M&A strategy phase and use them to orient the due diligence and integration processes and to drive value from downstream activities.
- **Learn how to integrate companies with different business models:** Rethink how to focus the due diligence process. Evaluating a company with a different business model requires asking a new set of questions and possibly having different people ask them; perhaps an objective advisor. Current staff members may not know what questions to ask about a new market segment, product type or revenue model.
- **Architect the integration. Start with the end goal in mind:** Think through how the new operating model is expected to work to retain and grow the acquisition company's value,

[27] Opportunities adapted from HBR "The Big Idea: The New M&A Playbook" - https://hbr.org/2011/03/the-big-idea-the-new-ma-playbook.

including what parts will and will not be integrated and how this integration will occur. Consider the impacts on a newly expanded product-and-services portfolio, supply-chain relations, delivery methods, customer service, and support.

There is a need to understand the challenges that the integration of these business models bring and for a new model of digital-technology acquisitions based on innovation to be developed. Specifically, there is a need to understand how integration choices made at the business-model level (go-to-market, product lifecycle, and customer lifecycle) have an effect on the operating-model capabilities and processes, including the impacts to information systems.

4.2 Technology Acquisitions at Cisco Systems

In a recent interview with John Chambers[28], now in his last year with Cisco as CEO, he detailed the

[28] Insights, quotes and information in this section are based on extensive personal experience by the author within Cisco and the digital-technology industry as well as adapted from

journey that he has led Cisco on over the past twenty-five years of its history. For Cisco, the transitions have forced them and their customers to think about data, security, and business models differently than in the past. Because of this, John Chambers and his executive team have had to make several tough decisions on priorities and engage the organization in a process of disrupting the market and at times, themselves.

As a large organization engaged in many different business models and competing as a platform organization (Gawer & Cusumano, 2002) which is attempting to increase its market share, this can be a challenge when a market is not in transition. As a growth strategy, Cisco has, throughout its company history, traditionally relied on its ability to acquire and integrate companies that match their current market offerings to their customers. With the emergence of digital technologies across multiple industries that previously were not as reliant on them to deliver value to customers, Cisco is now

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https://hbr.org/2015/05/ciscos-ceo-on-staying-ahead-of-technology-shifts

rethinking and strategizing on how to capture this reliance to transform its entire business. Since 2006, Cisco has begun a transformation away from its traditional markets and products and moved into business models in the security, collaboration, and software markets.

> "*When you're a large company with significant market share, it's tempting to view market disruptions as a threat, but we view them as an opportunity. When a market isn't in transition, gaining market share is hard—you're fighting to take one or two points of share from competitors. That's why we're transforming our entire business, expanding to capture growth and thinking very differently about the future of information technology.*" – *John Chambers, Chairman and CEO, Cisco*

Another way Cisco adapts is by using what they refer to as a "spin-in". They assemble a group of

engineers and developers to work on a specific project and move them out of the company, as if they were a start-up. These are instances where Cisco benefits from the group having a close proximity to the acquisition and high visibility to the development of the digital technologies in the company due to it's arms-length relationship. They are known for incentivizing the leaders and engineers with financial rewards if they meet their objectives during the incubation process. When the project is complete, Cisco moves its members back into the main company.

The role of technological integration is, for Cisco, a two-headed challenge. While, in general, over 40 percent of acquisitions fail, the role played by the integration of information systems is often seen as one of the top causes for these failures. As a digital-technology company, Cisco must not only integrate the information systems within the scope of corporate processes but it must also integrate the technologies from a product-offering perspective, both of which are challenging.

5. THEORETICAL POINT OF DEPARTURE

The purpose of this chapter is to explicate and present the theoretical point of departure that worked as 'seed categories' in the research process to answer the overarching research question. The theoretical contributions discussed here have inspired and shaped the conclusions drawn from the case studies done on the digital-technology industry in the United States and the results presented in the four dissertation publications. The chapter emphasizes the need to consult the existing information-systems (IS) literature and the need to use IS as a reference discipline in its own right (Baskerville & Myers, 2002).

5.1 Core Literature – Information Systems in M&A

In the literature, a lot of attention has been given to the mergers and acquisition strategies pursued by companies motivated by product extension, market extension, vertical (supply chain/operations consolidation) and horizontal (business consolidation) based on findings in research

publication #1. Academic scholars recognize the importance of IS in the integration process and the ability to capture the anticipated value from mergers and acquisitions. Extant literature has focused primarily on two streams of literature: integration capabilities and integration challenges. Additionally, through a systematic review of the extant literature, it is also important to note the categories which have been used to research the domain. These categories are *object of study, the research approach,* and *theoretical development*. Following a review of the integration capabilities and challenges is a review of each of these categories to give the reader a full account of the extant literature.

Integration Capabilities and Challenges

Literature on integration capabilities has focused on the capabilities managers employ to manage the diagnosis and implementation phases of IT integration. Ensuring a strategic positioning and alignment is of paramount importance in order to ensure a successful integration and has been a focus of much of the literature in this domain.

Studies by Merali and McKiernan (1993) and Mehta and Hirschheim (2007) have contributed to the extant literature by highlighting the decisions managers must make in the post-acquisition phase. Two additional papers focus specifically on the value creation and synergy diagnosis of M&A (e.g. Tanriverdi and Uysal, 2013). These researchers provide a perspective on finding and prioritizing synergies and acquirer value creation. Lastly, Yetton et al. (2013) provide a contribution to the extant literature that helps to get acquirers "ready to acquire" with a focus on integrating IT resources for a growth-by-acquisition strategy.

Additional research in the integration-capabilities knowledge domain focused on the implementation of the integration. The capability of determining the most suitable implementation strategy and assessing capability fit is the focus of studies done by Alaranta and Henningsson (2008) and Wijnhoven et al. (2006). Both focus on the process of shaping IS-integration strategy. Mehta and Hirschheim (2004) present a framework for assessing IT-integration decision making in M&A,

while Johnston and Yetton (1996) contribute a framework that focuses on fit, compatibility, and models of change. Surprisingly, only two papers are focused on the area of technology-intensive acquisitions (Robbins & Stylianou, 1999; Bannert & Tschirky, 2004). These studies look at the impact of technology-intensive acquisitions on IS capabilities and highlight challenges that are faced in the process.

Establishing a solid foundation for researching a literature domain is critical. The following is an abridged version of the more thorough review of extant literature on IS in M&A that was documented in research publication #1 as part of this doctoral research project. The results are discussed in more detail in a later section. Despite the extant research, explanations for successful M&A remain incomplete (Haleblian Devers, McNamara, Carpenter, & Davison, 2009). In addition, as business practices and global conditions for businesses evolve, so do the foundations for value creation in M&A. Consequently, the explanation of how value is

created becomes a search for a moving target (Henningsson & Carlsson, 2011). Explanatory models must be revised continuously in response to the evolving business conditions on which successful M&A are contingent.

One critical aspect of this evolving domain is that businesses have become dependent on their information systems (IS). These now play a critical role in the realization of value from M&A. Sarrazin and West (2011) estimate that 45–60 percent of the expected benefits from M&A are directly dependent on post-acquisition IT integration. In addition, a survey by Accenture identifies IT integration as the second most important reason for M&A failures (Accenture, 2006).

Research Categories

When examining the extant literature, it is necessary to look at three different categories in order to give a representation of the state of the art and to understand the opportunities to extend the current research and advance the literature into new areas of study. The three categories examined in

this literature review, and in more detail in research publication #1, are *the object of study, the research approach,* and *theoretical development*. We shall discuss each of these three below.

Object of Study

Three groups of papers define the object of study. The first of these groups defines the *transaction object*. This category looks at M&A in general, mergers, individual acquisitions, and acquisition programs. The second group defines the *chief actor*. The chief actor can be the merging partner, the acquirer, or the acquisition target. The third group defines the *industry context*. This category covers finance and insurance; health care and social assistance; professional, scientific and technical services; utilities; manufacturing; transportation and warehousing; and information about real estate and rentals.

The first group of papers investigates the transaction object. In this group, the literature is focused on a narrow set of organizational transactions. The typical transaction studied in the

extant literature is a single acquisition in which either a large firm acquires a smaller business unit or two single business firms merge to achieve economies of scale. In both instances, the intent is to capture the economies of scale or scope. This focus on a narrow scope of transactions is limiting in two ways. First, there is a lack of research on acquisition programs; and secondly, there is limited research on transactions motivated by benefits other than the economies of scale or scope. Increasingly, M&A are used to access technological innovations and innovation capabilities (Sears & Hoetker, 2014; Makri, Hitt, & Lane, 2010).

The second group of papers is focused on the chief actor and shows that previous research has placed emphasis on the perspective of only one partner in a merger or on the acquiring partner in an acquisition. There has been limited research on the perspective of the vendor and the acquired organization. The exception to the former is Böhm et al. (2011), which examines the acquisition of a

business unit by a multiple-business organization (MBO) from the perspective of the vendor.

The third group of papers focuses on the industry context and has largely investigated the role of IS integration in manufacturing (Alaranta, 2005; Henningsson & Carlsson, 2006; Henningsson & Carlsson, 2011; Henningsson & Yetton, 2011; Henningsson, 2014; Yetton et al., 2013; Garcia-Canal, Martinez-Noya, & Guillen, 2013) and financial industries (Buck-Lew, Wardle, & Pliskin, 1992; Holm-Larsen, 2005; Johnston & Yetton, 1996; Lin & Chao, 2008; Murphy & Platt, 2002; Seddon, Reynolds, & Willcocks, 2010; Gregory, Keil, & Muntermann, 2012; Parada, Alemany, & Planellas, 2009). These are attractive industries that can help a researcher gain an understanding of IS-integration challenges and solutions and the competitive rules governing these industries are well understood. While IS-integration issues are important in manufacturing and financial industries, we find it unlikely that research on other industries would exhibit the same IS-integration challenges and solutions.

In digital industries, for example, much of the logic of competition is contingent on an innovation arms race rather than by economies of scale and scope. The lack of research on digital industries is certainly linked to the lack of research on technology acquisitions. Frequently, access to innovative technologies and related capabilities are components of the rationale behind many larger acquisitions. In those acquisitions, the specific opportunities and challenges of technology acquisition may be confounded with other factors and processes.

Research Approach

Two sub-categories of papers define the research approach adopted in each paper: the data-collection group and the theoretical-framework group. The papers in the data-collection group differentiate between the collection of qualitative and quantitative data and the papers in the theoretical-framework group refer to the theoretical basis used to frame the study presented in the paper.

In the general literature on M&A, studies based on quantitative data (surveys and empirical studies) outnumber the studies based on qualitative data (single and multiple case studies) by a factor of twenty to one. In contrast, in the extant literature on post-acquisition IS integration, only twelve of forty-seven papers are based on survey or empirical data (see further details on research findings in research publication #1).

In the extant literature on M&A, studies have been based largely on strategic management and organizational theories. Specifically, four mainstream theoretical frameworks, Alignment Theory (eight papers); Organizational Culture/Learning (six papers); Resource-Based View (twelve papers); and Strategic IS Planning (eight papers), have been utilized in thirty-four of forty-seven papers.

Given the relative novelty of the area, surprisingly few papers have adopted grounded methods to develop theoretical models. Instead, the common strategy has been to extend the use of theoretical

frameworks that have proven useful in the investigation of related subjects. Absent from the extant literature are examples of some of the most commonly used theories in IS research, including adoption theory, portfolio theory and various forms of innovation theory. We speculate that the threads of research in this field primarily have been based on the seminal work of a few researchers and the cumulative building of explanations for the issues identified in early research on IS in M&A. As new research directions emerge, the use of new theoretical lenses will be necessary.

Theoretical Development

In this category, two sub-categories of papers describe the theoretical development of the phenomenon being investigated. The first is the nature-of-theory development group. These papers determine which of Gregor's (2006) five categories of theory development is the primary intent of each paper. The second is the research-focus group. The emphasis here is to categorize the primary area of theory development.

Gregor's (2006) taxonomy of theories differentiates between five types of theories: a theory for analyzing, a theory for explaining, a theory for predicting, a theory for explaining and predicting, and a theory for design and action. If we apply this taxonomy, we find that the literature is divided in the following way: eight papers developed a theory for analyzing, twenty-four developed a theory of explanation, three developed a theory for prediction, six developed a theory for explanation and prediction, and six developed a theory for design and action. The emphasis on theories for explanation may be transitory and simply a function of the limited research on the topic. Consistent with this explanation, the argument is frequently made that the field is sparsely investigated and that initial, exploratory theoretical development is needed. However, with forty-seven published papers, there is a theoretical body of knowledge on which to build, and there is less need for more exploratory studies. Instead, there is the challenge to build theories for prediction and for design and action.

Core Literature Summary

To advance the research field, two critical gaps have been identified as a basis for the development of our research programs. The first research gap is the managing of the known. That is, for the IS issues we have identified, and for which we have initial explanations, research should focus on developing theories for prediction and action. The second research gap is the exploration of the unknown. It is in this latter research gap that we situate our research in this dissertation work.

Motivated by the findings of the systematic literature review (described in more detail in research publication #1), research can approach these unknown aspects of IS integration in M&A through three broad streams of research directed at three empirical phenomena that have received little attention in the extant research: serial acquirers and acquisition programs, mergers and acquisitions between MBOs, and innovation-driven acquisitions.

Comparing the findings of the systematic literature review with the background information of the digital industry, with a specific focus on Cisco, it is evident that there is a gap between the *state of the art* in IS literature and the reality faced by companies in the *digital-technology industry.* As mentioned in the introduction, this thesis is therefore about how companies in industries fused with digital technologies (cf. El Sawy, 2003; El Sawy et al., 2010) manage technological-integration challenges related to acquisition as a strategy to strengthen their market position during technological transitions of the industries.

Technology acquisition is beneficially studied in acquisitions where innovative technologies and related capabilities are the prime motives (Sears & Hoetker, 2014). This entails investigation of high-tech industries where technology acquisitions are most frequent. Investigating high-tech industries does, however, require careful consideration of how companies compete in these industries, including system-based competition and platform organizations. These aspects of technology

acquisitions have not been addressed in the general management literature on technology acquisitions. Consequently, in this area, IS researchers could draw on core theories of the IS discipline to inform a significant body of research currently struggling with the explanation of a major contemporary phenomenon.

5.2 Extended Literature – Technology Platforms and Enterprise Architecture

In addition to the core literature on information systems, the research publications also drew inspiration and insights from two other domains of literature in a significant way. First, we reviewed the seminal and most influential literature in the domain of technology platforms; a domain that a majority of technology companies utilize in their approach to strategic growth and interaction with their customers and competition. Second, we reviewed enterprise-architecture literature which provided the foundation for the theoretical lens applied during the focused phase of the research project. The review of these two bodies of literature was not intended to be exhaustive but merely to

provide the reader with an overview of the current state of the art and the historical roots of the literature.

Technology Platforms

The research domain of technology platforms is critical to the research objectives of this dissertation as it helps to connect the current literature on IS in M&A to the challenges faced by digital-technology companies who are competing in this type of environment. The digital sector provides several widely recognized examples of technological platforms and their associated "platform leaders" (Gawer & Cusumano, 2002) or "keystone firms" (Iansiti & Levien, 2004), such as Google, Apple or Facebook. Each of these firms plays a central, orchestrating role within a network of firms and individual innovator/developers that have come to be collectively referred to as the platform's "innovation ecosystem" (Adner & Kapoor, 2010; Nambisan & Sawhney, 2011) or "ecologies of complex innovation" (Dougherty & Dunne, 2011).

Despite the importance of technological platforms, the management research agenda has been limited and divided. It has been dominated by two distinct theoretical perspectives: one inspired by economic theory and the other by engineering design. These perspectives have developed separately and have conceptualized platforms either as types of markets (two-sided markets, Rochet & Tirole, 2003) or as modular technological architectures (Baldwin & Woodard, 2009). Rooted in different intellectual traditions, and based on distinct assumptions, these theories have focused on the different directional forces platforms have to respond to.

While the economic-theory perspective has typically yielded insights on platform competition (Hamel, 1991), the engineering-design perspective has focused on platform innovation (Simpson & Marion, 2006). Both of these perspectives have been useful starting points, but these differing perspectives have not helped articulate how platform competition and platform innovation interact. This is a serious issue as platforms operate

in ways that often combine innovation with increased competitive tensions within their ecosystems and/or across ecosystems. For example, in 2012, the social networking platform Facebook developed a new mobile phone "home screen" application called Facebook Home. The company used Android (Google's mobile phone operating system; itself an important technological platform) as a tool to build the new application. Facebook then positioned Home to take center stage in the end user mobile phone experience; thereby, expanding Facebook's presence in the mobile phone space. As a result, a formerly collaborative relationship with Google was turned into a competitive one. In addition, Facebook has innovated in the domain of social search, as has Google. This has resulted in the establishment of another space where these two firms will compete even more for end users' attention and sources of digital-advertising revenues. These examples indicate that platform innovation and competition cannot be understood in isolation and suggest that

these forces interact to shape the evolution of platforms.

The important issue of interaction between platform innovation and platform competition has recently begun to attract scholars' attention. Boudreau (2010) draws on engineering-design literature to study "open platform strategy and innovation"; while, Eisenmann, Parker, and Van Alstyne (2011) draw on economic analysis to present the competitive analysis of "platform envelopment" in terms of market entry and bundling. While these studies are both attentive to platform innovation as well as to competition, the different framings reflect the remaining gap between the theoretical perspectives on platforms.

Enterprise Architecture

Macroeconomic trends, such as globalization, information digitization, broadband proliferation and the consumerization of IT, have caused enterprises all over the globe to reinvent their business models to take advantage of these trends and gain a competitive advantage. These business

trends have resulted in the adoption of digital technologies across industries. The scale and complexity of such technology adoption is large and impacts on crucial aspects of enterprises including target markets, offerings, pricing methods, customers, channel partners, suppliers and the workforce. Changes in the business also affect various aspects of operations, such as operational scenarios, business processes, policies, and important business metrics. All these changes, in turn, have an impact on the systems that are used to automate business operations.

Often, changes in the company's technology infrastructure are needed to achieve the desired shifts in a company's business model and operations. In order to manage these enterprise transformations, many companies turn to enterprise architecture (EA). EA capability provides the organizing logic for an organization's business processes and associated information systems, ensuring alignment between the business and IT

strategies[29]. EA has three primary purposes: providing a blueprint for the current state of the organization (description purpose), the desired target state (design purpose), and the roadmap for achieving and evaluating the target state (assessment purpose)[30].

Traditionally, EA has been concerned with understanding and representing the fundamental component of the enterprise through modelling methods and notations. Meanwhile, little attention has been paid to the set-up and implementation of EA concepts in organizations (Löhe & Legner, 2014). Löhe and Legner (2014) also pointed out that EA management suffers from not being properly embedded into the organization and existing IT management practices. Thus, while EA research and practice has mainly been preoccupied with the overall analysis and documentation of the enterprise, knowledge is lacking when it comes to

[29] Ross, J, et al. (2006) "Enterprise Architecture as Strategy", Harvard business school. J. A. Zachman (1997), "Enterprise architecture: The issue of the century," Database Programming and Design, 1997

[30] Stelzer, D. (2009), "Enterprise Architecture Principles: Literature Review and Research Directions", 4th Workshop on Trends in Enterprise Architecture Research (TEAR), November 23rd, 2009, Stockholm, Sweden

how the ideas and architectural plans are realized through everyday projects, system implementations etc. and how these elements contribute to the architecture. As a result of this lack in the operationalization of EA, architectural teams in businesses and in the field in general have often been criticized for acting as if they were living in an ivory tower (Koch, 2005). Their models and theoretical discussions are disconnected from the practical concerns of businesses and, as a result, are not adding any value to the organization.

Since EA is a rather new field, its attention on conceptual levels seems like a natural point of departure. On the other hand, it also seems timely, more than twenty-five years after Zachman's (1987) seminal paper, to consider how the goals and benefits defined through EA can be ensured through the operational activities that shape and transform today's enterprises. Furthermore, by moving from being a predominantly technical discipline focused on narrow technological problems and solutions towards being a business discipline, EA needs to provide more clear

indications that IT initiatives are moving the business in the right direction (Fonstad & Subramani, 2009).

Fonstad and Robertson (2006), who stressed the importance of ensuring alignment between the three levels of the business, have explored how to link individual efforts, project objectives and enterprise-wide objectives on the company level, the business level, and the project-team level. This is done through methods such as company-wide governance and linking mechanisms (Fonstad & Robertson, 2006). Though general guidelines exist, both practice and theory seems to lack actual indications on how each project contributes to the overall architecture.

Since EA emerged as a field in the beginning of the 1980s with IBMs 'Business System Planning method' (Ahlemann, Stettiner, Messerschmidt, & Legner, 2012; Zachman, 1987) and the later development of the Zachman framework (Zachman, 1987), EA has developed both within academia and practice. Still, EA as a concept is

associated with a great deal of ambiguity (Kappelman, 2010 p. 1). Nonetheless, finding types of evaluation that are relevant to EA requires an understanding and conceptualization of the topic. The following definitions of EA are used in this research project as foundational definitions of the domain.

	Definition	***Main concepts***
Ross (2014)	"The organizing logic for business process and IT capabilities reflecting the integration and standardization requirements of the firm's operating model."	Integration and standardization of core processes
Lankhorst (2005, p. 3)	"A coherent whole of principles, methods, and models that are used in the design and realization of an enterprise's organizational structure, business processes, information systems, and infrastructure"	Design and realization of organizational structure, business processes, information systems, and infrastructure.

Bernard (2012, p. 31)	"The analysis and documentation of an enterprise in its current and future states from an integrated strategy, business, and technology perspective"	Integrated view of strategy, business, and technology.

Table 3. Common enterprise-architecture definitions

From the above definitions, it is evident that EA is a broad concept. For this reason, it can be challenging to grasp all the elements of EA and how they relate to each other. Because of this, a number of EA frameworks exists which describe the key elements of EA. These frameworks are often divided into different subdomains, which in some cases can be further subdivided (Kappelman, 2010, p. 247).

For example, a domain can be divided into business architecture, information architecture, and technical architecture (Kappelman, 2010, p. 247), or data architecture, application architecture, and technology architecture (Spewak & Hill, 1993). However, the definitions above (Table 3) also

stress how EA is concerned with not only the different technical levels of the organization, but also with the tactical and strategic levels of the organization. By being involved in organizational policy and strategic coherence, the contribution of EA is often related to non-quantifiable elements. It is often valuated in other ways than financial measurements, such as through the evaluation of realized benefits (Plessius, Slot, & Pruijt, 2012). Some of the benefits identified in the literature by Tamm, Seddon, Shanks, and Reynolds (2011) are reduced risk, improved integration, stability, improved business processes, and increased responsiveness and guidance to change.

Accordingly, EA focuses on technological solutions and how technology can help support standardizing existing processes. Thus EA enables alignment between IT and the rest of the business. Through this alignment, EA is seen as a driver for enhanced business execution by digitizing routine processes and capabilities (Ross et al., 2006, p. 3-4; Weill & Ross, 2009, p. 1-20). On the other hand, in order to drive current processes efficiently and

drive ongoing effectiveness, EA needs to consider the organizational strategy and the future state of the organization.

For this reason, EA is both concerned with the *as-is* and the envisioned *to-be* architecture of the enterprise. To get an overview of both the current state of the organization's EA and the envisioned future state, enterprise architects often describe and view their architecture as going through a number of different architectural stages or maturity levels (Open Group, 2009; Ross et al., 2006; Weill and Ross, 2009). As enterprises shift from one maturity stage to another, they also shift their investments in IT and business-process redesign (Ross et al., 2006 p. 71-72), and with this, their architectural goals and priorities.

5.3 Summary

The research opportunities for extending the known and expanding the state of the art into the unknown, as indicated earlier, provide the opportunity to position this doctoral project within the digital-technology industry. The literature on

technology platforms and EA is provided as a foundational, but non-exhaustive, review of all literature in these domains. The extended literature domains will provide the reader with the needed insights for the purpose of this cover manuscript. Additional literature specific to the topics addressed in the individual research publications can be found there. The research opportunities identified in the literature review motivates the following section which describes the overarching research methodology used to investigate and research the digital-technology industry further.

6. METHODOLOGY

The research in this thesis was designed according to the principles of engaged scholarship (Van de Ven, 2007) paired with a critical-realist research perspective (Alvesson & Deetz, 2000). The intent is to create practice research (Mathiassen, 2002)—a category of engaged scholarship research which focuses on understanding IS practices and informing or advising relevant stakeholders.

The chapter is structured as follows. The first section outlines the philosophical underpinnings of this research. The second section describes how the researcher developed the overarching research question. The third section explicates the use of engaged scholarship in relation to this research project and the fourth section details the three conceptual research phases this research project has gone through. Finally, the fifth section details the research process and the last section summarizes the chapter.

6.1 Philosophical Underpinnings

As detailed earlier, this research project is positioned within the engaged-scholarship research tradition. In the following section we intend to make our philosophical underpinnings explicit, including the elements of critical research we have followed, and the role of critical research in the research conducted.

Engaged scholarship is based on a critical-realist philosophy of science (Van de Ven, 2007). Based on this assertion, it is important to recognize that

our understanding of the real world is limited and in alignment with interpretivists—all facts, observations and data are theory laden. Therefore, given the focus on understanding the complex phenomenon of digital-technology acquisition, knowing a complex reality demands the use of multiple perspectives and the use of invariant robust knowledge across multiple models. Throughout the research phases, it has been critical that the developed models, as well as the selected models that are developed, fit the problem or phenomenon as best as possible. It is known that through iteration, models evolve and produce an evolutionary growth of knowledge.

According to Rowland (1995), any research study reflects a particular worldview composed of at least three philosophical layers: ontological beliefs, epistemological assumptions, and methodological choices. Ontological beliefs are our beliefs regarding reality (or what it is); epistemological assumptions are our assumptions regarding how we come to know about our world (i.e. our sources of knowledge, or how we make sense of reality) and

methodological choices are the means we choose in order to achieve our desired ends.

Specific ontological beliefs lead us to make specific epistemological assumptions. That is, our explanations of how people come to know about the world around them depend on what we believe the world to be. Likewise, particular epistemological assumptions lead us to choose certain methodologies over others. We choose to carry out activities that fit with how we assume humans come to know. (Rowland, 1995, p. 278). Therefore, a realist believes in the primacy of ontology.

Based on the guidance of Orlikowski and Baroudi (1991), the researcher understands critical research as a critical stance toward taken-for-granted assumptions about organizations and information systems, and where the aim is to critique the status quo "through the exposure of what are believed to be deep-seated, structural contradictions within social systems" (p. 6). In the research on IS in M&A, it is well-accepted that the research domain

is well covered; however, given the gap that has been identified and the new avenues that have opened up for research, it is evident that critical research is a reasonable choice for this type of research.

Critical research is one of several research traditions in IS and differs from the positivist and interpretive research philosophies, both of which "are content to predict or explain the status quo" (Orlikowski & Baroudi, 1991, p. 19). Unfortunately, these distinctions are not always that clear-cut in the practice of social research. Based on the researcher's present understanding of the role of research philosophies, these philosophies are used to frame the goal, the approach, and the assessment of this research.

Elements of Critical Research

Among scholars there are different perspectives about how to conduct critical field research. For this study, the chosen framework is that of Alvesson and Deetz (2000) who suggest that critical research is comprised of three elements,

namely insight, critique, and transformative redefinition. The use of the term elements serves to emphasize that, in the practice of critical research, it might neither be practical nor desirable to completely separate these three elements from each other; they are all, to some extent, interconnected. All three elements are present in a critical study. The three elements are summarized in Table 4 along with their purpose in a critical research study.

Element	***Brief Description***	***Their purpose***
Insight	This element is concerned with interpretation and gaining insight. Insight can be gained in various ways (e.g. using critical hermeneutics and the archaeology of knowledge or using the concepts of social reproduction via the mechanisms associated with symbolic capital).	The purpose of the first element is to provide a broad insightful understanding of the current situation before engaging in critical analysis as outlined in the subsequent elements.

Critique	This element is concerned with critique, the genealogy of knowledge, and the social practices of control and reproduction. This element goes beyond interpretation to focus the researcher on the power structures that lie behind accepted interpretations.	The second element of critique requires critical researchers to adopt a more critical stance than interpretivists. The purpose of critique is to reveal the normative basis of the current situation found in the research site and the forms of legitimation that justify the current social order.
Transformative Redefinition	This element is concerned with suggesting improvements to the conditions of human existence, existing social arrangements, and social theories. Theories are not the primary driver for changes, but	The third element, transformative redefinition, looks at developing critical, managerially relevant knowledge and practical understandings "that enable change and provide skills

	potentially fallible lenses through which we see the world. The ultimate arbiters of the desirability of changes are those affected by them.	for new ways of operating" (Alvesson & Deetz, 2000, p. 19).

Table 4. The elements of critical research (Alvesson & Deetz, 2000)

Role of the Critical-Realist Research Perspective in the Present Study

The contention in this research is that the current IS in M&A frameworks and the methods proposed by practitioners, as well as by academics, are too simplistic to explain the complex organizational M&A processes in digital-technology industries. Consequently, the underlying ontological understanding in this research is that the uptake and continuous use of the new digital-technology-acquisition phenomenon cannot be seen as an isolated entity. It must be viewed as part of a social reality shaped by external and internal institutional forces. Meanings are socially constructed rather than universal 'givens' and are thus contingent on

the specific social context within which they are embedded.

In terms of the process of how explanations or knowledge is generated (epistemology), qualitative research is broadly characterized by analytical induction in which the researcher moves from empirical observation to generalization (Myers, 1997). Most qualitative research is naturalistic and holistic in that the focus is generally on studying both the organizational context and the information technology as emergent elements (Lee, 1999). It is also open-ended and flexible in that the research question may be modified as the research progresses and new data are collected and new avenues of inquiry are suggested (Lee & Baskerville, 2003). With the aim of producing an in-depth understanding of why and how technology is acquired and integrated in digital-technology companies, the epistemological belief in this research is that M&A must be understood as a social phenomenon in a given setting. That phenomenon must be understood by producing rich

descriptions of the acquisition and integration process.

The theory of this research is that prior theoretical knowledge is used to get a preliminary hold on the field of study in the form of tentative prior constructs (Eisenhardt, 1989) or seed categories (Miles & Huberman, 1994). As noted earlier, the classical and contemporary IS in M&A theory and the theoretical perspectives on adoption have informed this research. Unlike a deductive approach, critical theory has, however, not been a device used prescriptively for factor classifications in the research, and the case studies have not been approached with prior conceptions in mind. This research generalizes from rich empirical statements to theoretical statements by analyzing multiple sources of evidence. Inspired by the fundamental principle of the hermeneutic circle (Klein & Myers, 1999), the field studies have been shaped by the findings and the theory by moving between the 'parts' and the 'whole'. In this way, the analysis of the data collected from the various sources reflect and expand the theoretical grounding of this

dissertation by trying to identify important content, context and process elements of the digital-technology-acquisition process. This process has been described as a move from “generalizing from empirical statements to theoretical statements” (Lee & Baskerville, 2003).

Interpretive and Critical Research: The Similarities and Differences

As discussed earlier, the distinction between the approaches are not always so clear-cut in the practice of social research (e.g. see Lee, 1989). The philosophical assumptions are important because they frame the goal, the approach, and the assessment of the research. In other words, the basic philosophical assumptions guide what this research tries to achieve, how it tries to achieve it, and how the results of this research are assessed. The three basic research philosophies applied in IS research are positivist, interpretive, and critical research (Boland, 1986; Lee, 1989; Orlikowski & Baroudi, 1991; Myers, 1997; Walsham, 1993). Orlikowski and Baroudi (1991) use three "sets of beliefs" to describe positivistic, interpretive, and

critical research. The three sets of beliefs are belief about physical and social reality (ontology), belief about knowledge (epistemology), and belief about the relationship between theory and practice.

While we have earlier argued that we are applying a critical-realist perspective to our research described and applied in this cover manuscript as well as in the research publications, we would like to clarify that there is a the continuum, or blurred border, between the interpretivist and critical-research philosophies. This continuum can lead to researchers having two different perspectives regarding critical research.

In the *first* perspective, critical research is seen as a third type of research philosophy or epistemology, distinct from positivist research and interpretive research (Orlikowski & Baroudi, 1991). Ngwenyama and Lee (1997) describe the added value and additional insights that can be obtained from critical social theory *vis-à-vis* interpretive research. Hence, critical research is seen as distinct

from interpretive research and as having its own unique philosophical foundation.

The *second* perspective suggests that there are different degrees of interpretive and critical research, ranging from pure interpretivism to strong critical research. Although the extreme ends of the range might be quite distinct, there might be some common ground in the middle. Doolin and McLeod (2005) prescribe to this perspective. They argue for "critical interpretivism" as a middle position between pure interpretive research and critical research. Earlier, Myers (1995) proposed critical hermeneutics as an integrative framework with which Doolin's critical interpretivism has many similarities.

To sum up, our research described in this cover manuscript and research publications remains distinctly on the critical-research side of the continuum, although, in the analysis of interviews and the focus-group processes, we will apply elements from the interpretivist research perspective.

6.2 Research Approach and Developing the Overarching Research Question

As stated earlier, the overarching research question bridging this research was developed through a reflective and inductive learning process. A central mission in the work was to conduct research that both advances the scientific disciplines and enlightens practitioners adopting the new M&A integration phenomenon in technology companies. This research followed the engaged-scholarship research tradition using the ontological lens of a critical-realist perspective and is therefore concerned with studying complex problems with and/or for practitioners and other stakeholders. The research approach is a form of inquiry where researchers involve others and leverage their different perspectives to learn about a problem domain (Van de Ven, 2007).

The engaged-scholarship research tradition was particularly interesting as the researcher sought to understand the domain of digital-technology acquisition from an IS perspective. Engaged scholarship offers the researcher an opportunity to

develop a relationship involving negotiation, mutual respect, and collaboration to produce a learning community, which is later detailed as a key tenet of the *practice-research* knowledge interest (Mathiassen, 2002).

The critical-research perspective is a useful lens as prior research in information systems has been concerned with social issues such as freedom, power, control, and values with respect to the development, use, and impact of information technology. Given the interest in opening up new avenues of research on digital-technology acquisition and the role of practitioners, the critical-realist perspective is particularly useful as it can enrich understanding and improve practice (Stahl & Brooke, 2008). For the purpose of the researcher, critical research can help to challenge prevailing assumptions which is an important reminder and control mechanism when engaging in engaged scholarship (Orlikowski & Baroudi, 1991). Additional details on the philosophical underpinnings of the research are explicated in a later section.

6.3 Engaged Scholarship

The practice of engaged scholarship is largely attributed to Andrew Van de Ven and his seminal work in 2007 titled *Engaged Scholarship: A Guide for Organizational and Social Research*. Van de Ven (2007) focuses on scholars in professional schools, such as business, engineering, medicine, and law. IS scholars fall in that category whether they work in business schools, in computer science schools or in one of the recent multidisciplinary IT schools. A central mission of scholars in professional schools is to conduct research that advances science while at the same time enlightens professional practices. However, many professionals fail to adopt relevant research findings within their discipline and a lot of the published research "is not contributing in intended ways to either science or practice" (Van de Ven, 2007, p. 2). The resulting theory-practice gap in professional disciplines can to some extent be addressed by more effectively translating and communicating scientific knowledge to practicing professionals.

There are, however, major differences between scientific and practical knowledge as expressed in Aristotle's distinction between episteme (basic knowledge in the pursuit of theoretical or analytical questions) and techne (applied technical knowledge of instrumental or means-end rationality); in Schön's (1983) distinction between knowing-about-practice and knowing-in-practice; and in Polanyi's (1967) distinction between explicit and tacit knowledge.

Practical knowledge is not simply a derivative of scientific knowledge. Instead, it is a distinct form of knowledge that together with scientific knowledge constitutes the foundation of a professional discipline (Kondrat, 1992, p. 239). Based on this understanding, the challenge for scholars is to improve knowledge transfer from theory towards practice. More importantly, scholars need to develop and exploit new forms of knowledge production that facilitate and leverage interactions between practice and theory to develop scientific as well as practical knowledge.

Engaged scholarship is an approach to research that accepts this challenge. Van de Ven defines engaged scholarship as "a participative form of research for obtaining the different perspectives of key stakeholders (researchers, users, clients, sponsors, and practitioners) in studying complex problems" (Van de Ven, 2007, p. 9). Moreover, he defines four different forms of engaged scholarship: (1) informed basic research that is undertaken to describe, explain, or predict a social phenomenon; (2) collaborative basic research which is similar to informed basic research but entails a greater sharing of power and participation between researchers and stakeholders; (3) design and evaluation research which focuses on normative knowledge related to design and the evaluation of policies, programs, and models for solving practical problems within a profession; (4) action research which applies an intervention to address a problem of a specific client while at the same time contributing to academic knowledge.

The degree of collaboration with stakeholders is indeed an important distinguishing feature of IS

research; however, variation in stakeholder collaboration not only helps distinguish different forms of basic research, it also applies equally well to distinguishing forms of design and evaluation research and action research. A similar, but simpler, way to classify forms of engaged scholarship within IS research can, therefore, be based on their underlying knowledge interests (Mathiassen, 2002).

1. **Practice research:** focuses on understanding IS practices with the purpose of informing or advising relevant stakeholders.
2. **Design research:** focuses on designing various forms of artefacts with the purpose of supporting stakeholders engaged in IS practices.
3. **Action research:** focuses on changing IS practices through problem solving in response to specific client needs.

Following this classification, the research across the four research publications and the cover manuscript can be seen primarily as *practice research* as they focus on understanding the

practices currently in place in digital-technology companies as they undertake the process of acquisition integration of digital technologies. The purpose of the contributions to practice, as described later, are to inform and advise the relevant stakeholders, who in this context are both M&A managers in digital companies, Chief Information Officers and the Heads of Enterprise Architecture, among others.

To guide the engaged-scholarship process further, Van de Ven (2007) proposes the *Engaged Scholarship Diamond* as a method to guide the researcher through the process.

Following the idea of the engaged-scholarship-diamond model (Figure 2), the understanding of a complex whole is achieved by iterating between the parts of the diamond. The four bases of the diamond model are solution, model, reality, and theory (Van de Ven, 2007). The figure below illustrates this research approach where the *whole* is an understanding of the technical integration through the M&A process in digital-technology

companies, and the *parts* are the results of the multiple iterations through the four bases. The iterations through the diamond and the subsequent understanding of the phenomenon are explicated further in the remainder of the chapter. The results of the research process are documented in the four publications that will be outlined in the following chapters.

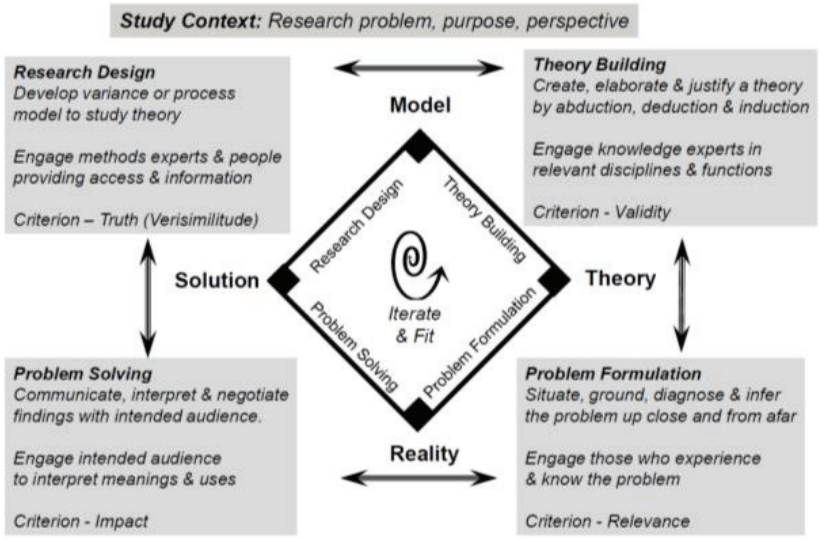

Figure 2. Engaged-scholarship diamond model (Van de Ven, 2007)

As the figure illustrates, understanding of the phenomenon changes over time, and new

perspectives appear as more data and literature are consumed. The *whole* changes over time for two reasons: 1) new *parts* are explained and interpreted and 2) the perceptions of the *parts* are changing as the analysis progresses and the interrelationships between the *parts* become clearer.

Similar to Simon's (1960) Intelligence-Design-Choice (IDC) model, this research started with an initial scanning phase where the feasibility of studying digital-technology acquisitions was investigated and situated first in the information-systems research domain. This phase identified interesting opportunities for research and called for further investigation. Gaps were then identified that needed further exploration. The engaged-scholarship process was ideal in connecting the research opportunities to the next steps in the research process. Leveraging an extensive network of practitioners, the author engaged both key informants directly through Cisco and through professional networking sites such as LinkedIn and local chapters of industry associations, such as the

Association for Corporate Growth[31]. The research continued with further iterations through the diamond by accessing explorative focus groups at the macro-level (industry) to further understand the phenomenon from practitioners and to open the research aperture to highlight areas at the firm level that could impact the process and technology levels of an organization.

Following this, a round of key-informant interviews was conducted to confirm and reflect on the focus-group findings and further understand the phenomenon at the next level of detail. This phase enlightened the understanding of digital-technology acquisitions at the macro-level in digital-technology industries and focused the research on two case studies in the final phase of the research period. The continued engagement, both formal through focus groups and key-informant interviews as well as informally through discussions about the research and subsequent reflection by the practitioners on the research project, helped to

[31] Association for Corporate Growth - http://www.acg.org/

continue to refine and develop the research questions and the approach further.

Hereafter, one case study was conducted at the micro-level of the organization to understand the role of enterprise architecture in the digital-technology-acquisition process and another case study at the macro-level to understand the role of platform organizations and their role in digital-technology acquisition.

Table 5 provides an overview of the four conceptual research phases included in the dissertation. The table outlines the steps in the engaged-scholarship diamond, the focus area, the research approach, the research objective, the research collaborators involved and the resulting dissertation publications for each of the phases. The following three subsections outline the research processes in which these publications were created and the overarching research question was coined.

Conceptual Research Phase	*Research Focus (Time Period)*	*Research Approach*	*Research Objective(s)*	*Research Collaborators*	*Resulting Publications*
Feasibility Phase	Comprehensive understanding of the 'state of the art' in IS research on the topic of M&A.	Database-driven literature search	Develop an inventory of IS research on the topic of M&A. Map the existing literature against categories and identify gaps that needed further exploration.	Stefan Henningsson Phillip Yetton	Research Publication #1
Explorative Phase	Investigate identified gaps from earlier phases. Investigate the digital-technology industries further	Explorative engaged scholarship Focus groups	Understand the M&A process at the firm level to identify challenges that could help us uncover new challenges at the IS level in these types of industries/companies. Then compare and contrast this with current IS literature to uncover new areas for	Stefan Henningsson Phillip Yetton	Research Publication #2

			further research.		
Focused Phase	Create rich case descriptions from leaders in the M&A domain	Case-study research	Create rich descriptions of two specific areas of interest based on the challenges faced by practitioners in the earlier phase.	Stefan Henningsson Graeme Shanks Phillip Yetton	Research Publication #3 and #4

Table 5. The three conceptual research phases

Feasibility Research Phase

With the given research topic on IS in M&A, the initial phase in the research was spent scanning the contemporary literature on these topics in the premier information-systems journals. The interest at this time was to understand the current state of the literature and how the topic of M&A had been covered within the information-systems domain.

At first, a focus on understanding the literature across a group of different categories was important. The literature study resulted in forty-

seven papers from top IS journals and conferences. The objective of this stage was to develop an inventory of IS research on the topic of M&A and to map the existing literature against categories in order to identify gaps that need further exploration.

No empirical data was collected in the first research phase. Instead, the initial version of what is now research publication #1 was published at an international IS conference which served for a good opportunity to discuss our findings with the IS research community. The publication highlighted the current state of IS in M&A literature for a subset of the final categories. It was evident at the time that there were some gaps that, if further explored, could yield some new and novel insights about how companies integrate technology into their organizations.

Upon review of the initial publication of the literature review, it was clear that we needed to add additional categories to our search and expand our timeline. The categories *theoretical frameworks*, *nature of the theoretical development* (Gregor,

2006) and the *research focus* were added along with a 'forward pass' based on the included academic papers to identify any papers that may have been missed in the first article. Following this, a second version of the literature review was published at another international IS conference for further discussion.

The result of the feasibility phase of the research was a thorough grounding in the current state of the IS literature as it relates to M&A. Two research programs were suggested as the outcome of this phase, *managing the known* with a suggested focus on the theoretical refinement of single acquisitions. This has been the predominant focus of researchers up to this point. The second program that was suggested was *exploring the unknown.* This would focus on organizations pursuing *serial acquisitions* as well as focus on the acquisitions and mergers of multiple-business organizations (MBOs). Exploring the unknown would also focus on *innovation-based acquisitions*, an acquisition strategy pursued by organizations within the digital-technology industry. This area of study was

significantly underrepresented in the literature search and likely holds new insights for IS researchers.

Explorative Research Phase

The theoretical insight gained through the initial feasibility research phase opened up many avenues for further inquiries. Thus, the explorative research phase can be described as a multifaceted learning, thinking, researching, interpreting, writing, and explorative phase of the dissertation research that provided a deep understanding about the process of acquisition and integration of technology in digital-technology companies.

The aim in this research phase was to investigate gaps that were identified in the initial phase. Based on the lack of literature in the digital-technology industry, there was a need to understand the phenomenon directly from various practitioners. Because of the author's experience in this industry, the choice of engaged scholarship was a good option to explore the phenomenon further. The goal was to understand the process of technology

acquisition and integration from managers and practitioners directly engaged in the day-to-day work. Through the explorative-focus-group technique, practitioners identified several themes with a level of affinity across their organizations, suggesting that these companies are encountering a common set of challenges during the M&A process. The findings from the focus groups suggested a number of firm-level issues that need to be addressed during an acquisition. Specifically, the areas of R&D team integration, sales enablement, and new business models were highlighted.

When compared to current IS in M&A literature, there were several gaps that were identified and suggested as future research opportunities. The affinity themes from the focus group were also used with a group of key informants through an interview process. The primary researcher interviewed M&A leaders from several of the highest profile digital-technology companies to further understand their specific processes. The interviews were also used as a validation and

discussion forum for the affinity themes identified from the focus groups. A final set of design principles, challenges, and enablers were identified and served as motivation for the research in the focused phase of the research project. The empirical material and insights from this phase provided the background for research publication #2, a paper published as part of an international conference. The aim of the publication was to connect the insights from the feasibility phase with the explorative phase and setup the empirical work in the focused phase.

The broad, explorative investigations in the second research phase improved the understanding of digital-technology acquisition in a number of valuable ways. Studying technology acquisition and integration both in a single organization (micro-level) through key-informant interviews and across the digital-technology industry (macro-level) through focus groups, contributed to the understanding of digital-technology acquisition as an emergent, evolving, embedded, fragmented, and provisional social innovation that is shaped as

much by cultural and structural forces within the organizational context in which they are implemented as by rational, technical and economic forces. The insight gained in the explorative research phase helped narrow the research focus for the final research phase where the unifying research question was finally coined.

Focused Research Phase

The aim in this research phase was to produce rich descriptions of two specific areas of interest based on the challenges faced by practitioners in their local context. The goal was to use two threads from the explorative research phase to further explain what challenges are faced in the digital-technology industry when acquiring and integrating technology and predicting how practitioners might overcome these challenges, thereby adding to the current body of literature in two ways.

The first case study concentrated on the role of the enterprise-architecture team at Cisco Systems. The results reported in research publication #4 suggest that the EA team is very important when it comes

to managing the acquisition-integration process of technology and can, at different stages in the process, add value through the use of several EA tools and techniques. Furthermore, the finding led to a focus on the role of the enterprise-architecture team in the digital-technology-acquisition process and other insights for the CIO staff.

The second case study investigated the process of digital-technology acquisition in platform organizations. Acquisitions have become essential tools to retain a technological edge in digital industries. The case study analyzes the technological-integration challenges in such acquisitions. The findings from this phase suggest that acquirers in digital industries are typically platform leaders in platform markets. They acquire (a) other platform providers to extend their platform core and to derive network effects by consolidating platform user groups, and (b) complement providers in order to create monopoly positions for the complements and for innovation complementarity.

The case study revealed that to obtain these acquisition benefits, acquirers face technological-integration challenges in terms of process and product integration. As a result of the case study and the subsequent research publication (#4), four propositions were developed explaining how the benefits of platform core and complement acquisitions are contingent on technical processes and product integration.

The opportunity to focus in on two specific cases allowed the researcher to step back and reflect on the investigatory process over the previous phases. The ability to iterate between the different stages of the engaged-scholarship-diamond framework and to shift between the micro and macro levels to observe the phenomenon helped develop the final research question bringing the different elements of the research together in a cohesive whole.

6.4 Research Process

Grounded in the ontological and epistemological assumptions outlined above, this section outlines, in detail, the research process across the three

research phases. We shall first describe the explorative focus group, the key-informant interview and the case-study research method applied, and we shall then continue with a discussion of the applied methodology for data collection and analysis. .

Research Method

Feasibility research phase: The initial phase of the research project was a literature study to provide a comprehensive inventory of the current state of the literature in the IS domain as it relates to M&A. To accomplish this review, a systematic literature review was conducted (Feak & Swales, 2009, p. 3). The review followed a strict methodology in the selection of the literature by making explicit the criteria for inclusion and exclusion. This was done to eliminate any potential bias. This approach was chosen because the desired outcome was to fully clarify the state of the existing research and the implications that could be drawn from the findings.

Explorative research phase: Employing the process of engaged scholarship, the purpose for the

explorative phase of the research was to use the model and findings from the earlier research phase to develop a research design that could be used to engage practitioners. Given the motivation of seeking an expanded understanding of IS-related challenges within M&A through the process of interacting directly with practitioners, a less-structured focus-group process was chosen as part of the engaged-scholarship research tradition. According to Morgan (1997), less-structured approaches to focus groups are especially useful for exploratory research, and given the interest in understanding the participants' challenges while leading the acquisition-integration process, the less-structured focus group was an ideal format.

To understand these challenges from the point of view of practitioners, as in this case, where the basic issues are not well documented in the literature and poorly understood or existing knowledge is based on researcher-imposed agendas, an unstandardized interview guide provides the opportunity to hear the interests of the participants themselves in each group. In addition,

minimizing the moderator's involvement in the discussion will give the participants more opportunity to pursue what interests them.

Focused research phase: The purpose of the focused phase was to create rich descriptions of two areas of focus identified during the explorative phase. The use of the case-study method was a useful way to frame both areas of focus that were chosen to be investigated further.

For research publication #3, the investigation focused on Cisco's enterprise-architecture practice and its role in the digital-technology-acquisition process. Empirical data for this article was obtained partly from first-hand experiences with Cisco's EA practice, where the author is employed as Senior Enterprise Architecture Manager. Personal experiences were complemented with twenty-two in-depth interviews with Cisco managers and employees involved in the firm's acquisitions to understand the role of EA in the acquisition process. Interview subjects ranged from the Chief Executive Officer (CEO) to line managers and

technical integrators. Public material (press releases, generic integration model, etc.) and internal documentation (target assessments, integration plans, performance evaluations, etc.) relating to Cisco's acquisitions contributed data points for triangulation of findings and confirmation of acquisition details.

The second case study, which resulted in research publication #4, focused on the technological integration of acquisitions in digital industries. This deviated ontologically and epistemologically from the remainder of the research project. The research presented in this paper followed an approach similar to analytic induction (Patton, 2001) with the purpose of developing an explanatory theory (see, for example, Gregor, 2006) while addressing technological-integration challenges which arose during acquisitions in digital industries. The analytic-induction approach was based on a positivist case study (Dubé & Paré, 2003; Yin, 1994), which is a different approach than critical or interpretive case study research, where the objective is a social critique or understanding of the

social construction of reality (Klein & Myers, 1999). The case setting supports the examination of how theoretical constructs translate into a new application area (George & Bennett, 2004). In addition, the case setting was also suitable for a rich exploration of acquisitions (Henningsson et al., 2010; Carlsson et al., 2011).

Data Selection, Collection and Analysis

Feasibility research phase: As stated earlier, the purpose for the feasibility phase was to understand the current state of the IS literature as it relates to the M&A field. The literature review in the feasibility phase was conducted in two steps. First, the scope was defined and articles fitting within that scope were identified. Second, a review of the research objectives, approaches, and contributions was conducted. Following Pateli and Giaglis (2004), the scope of the search was defined along three dimensions: outcomes, relevant time span and search terms used. To ensure a comprehensive result, three separate searches were conducted: an initial search, a backwards search by investigating the reference lists of the selected articles and a

forward search by investigating articles that cite the selected articles (Webster & Watson, 2002; Yang & Tate, 2012). To do this, a database-driven approach was adopted (Webster & Watson, 2002; Brocke et al., 2009) using a list of research material from academic journals and conference proceedings.

For the literature study in the feasibility phase, the process of scientometric analysis was used. Leydesdorff (2001, p. i) defines scientometric as "the quantitative study of scientific communication", and Lowry, Romans, and Curtis (2004, p. 30) define it as "the scientific study of the process of science." Lewis, Templeton, and Luo (2007) recommend the methodology to advance the on-going evaluation and improvement of an academic discipline.

Scientometric studies have been conducted on a broad range of topics in IS, including IS as a reference discipline and the epistemological structure of the IS field (Kroenung & Eckhardt, 2012; Grover, Gokhale, Lim, Coffey, & Ayyagari,

2006). The analysis of the articles in scope was partitioned into three sub-tasks: data coding, data display and drawing conclusions (Miles & Huberman, 1994). Drawing on Strauss and Corbin (1990), a technique similar to systematic categorization was employed to code the articles.

Explorative research phase: Because of the exploratory nature of the focus group as the chosen research method and the availability of a professional focus group moderator, the researcher chose to follow the steps of the KJ method: observation, analysis, and reporting. The KJ method is known as a method for establishing an orderly system from a chaotic mass of information. The KJ method involves the systematization and converging of the results of brainstorming. The feature of the KJ method is cooperative work focused towards gaining insights. The KJ method consists of four steps (e.g. entering idea labels, grouping idea labels, structuring groups, and writing a composition) which were employed by the researcher in the focus group. Extending this process, the researcher utilized the compositions

and the material from the focus group to identify the core focus areas that have the highest affinity for the focus group as a model for the use in the next research phase.

Focused research phase: The selection of the two case studies followed replication logic to deal with contradictory experimental findings in the field study (Miles & Huberman, 1994; Yin, 1994). By using replication logic, it was possible to generalize beyond the individual cases, even when they do not have random samples (Miles & Huberman, 1994). Constantly seeking a deeper understanding of why and how technology is acquired and integrated in digital-technology companies, the evolutionary use of case studies in this research helped improve the validity and reliability of the contributions to research and practice across the four individual scientific publications.

The selection of Cisco Systems Enterprise Architecture and M&A practice for both case studies can be characterized as opportunistic sampling (Miles & Huberman, 1994). As described

above, the primary researcher is employed by the company and understands the EA and M&A practices well. The setting thus allowed a first-hand understanding of EA and M&A processes. As noted by Miles and Huberman (1994), qualitative data collection can take many forms ranging from moving pictures to written data sources such as published and unpublished documents, reports, memos, email messages, newspaper articles, and so forth. Based on the interpretive-case-study research method, this research primarily uses individual interviews, focus-group interviews, and documentary materials. Table 6 provides an overview of the types of primary and secondary qualitative data used in the two dissertation case studies.

Consistent with the analytic-induction process, data were analyzed deductively and inductively. First, following a deductive approach, we analyzed the data in order to identify the different entities in our initiation frameworks/models.

In the case study used for research publication #3, a priori categories (Saldaña, 2009) representing several of the affinity groups identified during the focus group and key-informant interviews were used. In the case study for research publication #4, the acquisition types, value creation mechanism, and technical integration challenges were used to code the data. Following this step in both case studies, we used an inductive-analysis strategy. We revisited the case data to identify relationships between coding categories and to find general patterns. The discovery of relevant relationships was done with selective coding (Strauss & Corbin, 1990). Selective coding refers to "the process of selecting the core category, systematically relating it to other categories, validating those relationships, and filling in categories that need further refinement and development" (Strauss & Corbin, 1998, p. 116). Based on empirically induced findings and supportive theoretical arguments, propositions were derived. To integrate findings, we developed rich case stories supported by quotes and document references to ensure empirical

support for the emerging accounts. The rich cases were shared with interview participants in both cases to get feedback on the representativeness of our findings.

Case Study	***Data sources***	***Explanation***
1	19 Interviews	Formal, semi-structured interviews with practitioners. Interviews were transcribed and coded.
	7 Meeting Notes	Informal notes from discussions about EA and M&A
	8 EA Document Reviews	Examination of relevant documents and presentations produced by practitioners.
	10 M&A Document Reviews	Examination of relevant documents and presentations produced by practitioners.
	3 Participatory Observation	Taking part in action where problems were discussed or results from EA initiatives were used.
2	22 Interviews	Formal semi-structured interviews with practitioners.

		Interviews were transcribed and coded.
	4 Meeting Notes	Informal notes from discussions about EA and M&A.
	10 M&A Document Reviews	Examination of relevant documents and presentations produced by practitioners.

Table 6. Overview of primary and secondary qualitative data used in case studies

6.5 Summary

This chapter describes the development of the overarching research problem in three conceptual phases, explicates the philosophical underpinnings, and outlines the research method and techniques used throughout the research process. The appropriate research approach to answer the overarching research question in this dissertation was critical realist since it allowed the researcher to get closer to the complex social, political, and cultural context within digital-technology companies when technology is acquired and integrated. Consistent with this, a systematic-literature-review approach was used to get a hold

of the current state of the literature. Focus group and key-informant interviews were used in the explorative phase to further understand the technology-integration process and a case-study approach was chosen for the focused phase because it allowed us to get a deeper insight into a limited unit of analysis. This allowed for an explorative uncovering of nuances and shades that improved the understanding of digital-technology acquisition. In the following section, each research publication is discussed in detail and the connection to the whole is explained.

7. THE RESEARCH PUBLICATIONS

This chapter presents short summaries of the four research publications that form the main contribution to this research. The publications are under review or have been published separately throughout the dissertation period at peer-reviewed academic conferences (Publications #2 and #4) and in scientific journals (Publications #1 and #3). The publications are summarized in a uniform manner;

first the research objective is briefly presented, followed by an overview of the results and finally, the relation to the whole dissertation is summarized. The complete publications can be found in the Appendix.

7.1 Introduction to the Research Publications

The table below provides an overview of each of the included publications and the case-study foundation. The last section of this chapter outlines the praxis of the joint publications with other researchers and practitioners. The relationship between the research publications and their contributions to research and practice can be found in Table 9 in a later section.

#	Title	Authors	Outlet	Earlier version(s)	Empirical foundation
1	*Taking Stock and Looking Forward: Information Systems Integration in Mergers and Acquisitions*	*Toppenberg, G. Henningsson, S. Yetton, P.*	*European Journal for Information systems*	*2013 AMCIS 2014 ECIS 2014 AIS-JJWA*	*Extant Literature*

2	*Expanded Understanding of IS Related Challenges of Mergers & Acquisitions: Methods & Research Context*	*Toppenberg, G.*	*2015 European Conference for Information Systems*		*Key Informant Interviews with Tech M&A leaders*
3	*Technological integration of acquisitions in digital industries: a case study*	*Toppenberg, G. Henningsson, S.*	*2015 Annual Meeting of the Academy of Management*		*Cisco M&A Practice and Acquisitions*
4	*Sustaining an acquisition-based growth strategy: The use of Enterprise Architecture at Cisco Systems*	*Henningsson, S. Toppenberg, G. Shanks, G.*	*Management Information Systems Quarterly Executive*	*2015 ICIS MISQE Workshop*	*Cisco Enterprise Architecture and M&A Practices*

Table 7. Research publications in detail

The four research publications were developed over the course of the three research phases described earlier. Conducting research is never a

process of following a linear path but rather a process of overlapping efforts across multiple papers at the same time. To provide further clarity on the *lineage* of each of the research publications in this dissertation, the following figure illustrates the research activities undertaken and the timing of the publication of earlier versions of the papers.

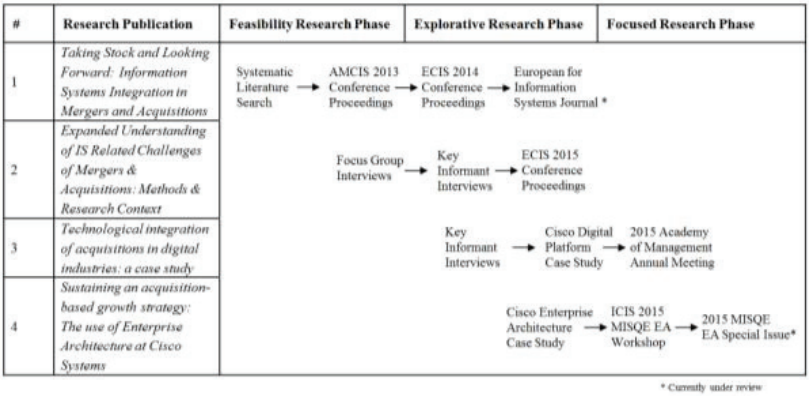

Figure 3 Lineage of the research publications

7.2 Synopsis of the Research Publications

Paper 1: "Taking Stock and Looking Forward: IS Integration in M&A"

Despite the extant research, explanations for successful M&A remain incomplete (Haleblian et al., 2009). In addition, as business practices and global conditions for business evolve, so do the foundations for value creation in M&A. Consequently, the explanation of how value is created becomes a search for a moving target (Henningsson & Carlsson, 2011). Explanatory models must be revised continuously in response to the evolving business conditions on which successful M&A are contingent. One critical aspect of this evolving domain is that businesses have become pervasively dependent on their information systems (IS). These now play a critical role in the realization of value from M&A. Sarrazin and West (2011) estimate that 45–60 percent of the expected benefits from M&A are directly dependent on post-acquisition IT integration. In addition, a survey by Accenture identifies IT integration as the second

most important reason for M&A failures (Accenture, 2006).

In response, research on the role of IS in M&A has increased. In the literature search described below, we identify forty-seven articles on this issue. Collectively, this research has contributed a range of important insights about IS issues in M&A. However, the research has significant gaps in the extant knowledge base and evolves in a non-cumulative mode (Wijnhoven et al., 2006; Mehta & Hirschheim, 2007; Henningsson & Carlsson, 2011). Therefore, to enable the research field to take stock of existing research and to inform future research, this paper reviews the object of study, the research approach taken, and the theoretical developments made in the extant literature on IS in M&A.

The motivation for the analytical focus of our review is that the object of study and the research approach have important implications for the theories that can be developed and the conclusions that can be drawn (Venkatesh, Thong, & Xu,

2012). Consistent with this, the review shows that research has favored some types of study objects and research approaches over others. This has limited theoretical developments.

Results: We identified and analyzed forty-seven articles published in fourteen journals and four IS conference proceedings. Based on the analysis, we identified gaps in the extant literature and suggested directions for future research.

Typically, extant research has focused on individual acquisitions or mergers of single-business units driven by economies of scale and scope. These have been studied in the context of manufacturing and financial industries based on theoretical frameworks from the strategic management and organizational disciplines, with a mix of case studies and survey methodologies. Within this narrow selection of research objects and research approaches, researchers have developed analytical and explanatory theories addressing the IS-integration challenges and capabilities associated with ensuring merger or

acquisition performance. To advance the research field, we call for two research programs. The first should focus on *managing the known*. That is, for the IS issues we have identified and for which we have initial explanations, research should focus on developing theories around prediction and action. Second, we call for a research program on *exploration of the unknown*. We should broaden the scope of objects studied and put more research into approaches taken beyond the current narrow frame. For example, we should research the performance of growth-by-acquisition programs rather than single acquisitions only and adopt quantitative analytical frameworks to analyze performance data to complement the research approaches in the extant research.

Relation to the whole: This paper was originally published during the initial feasibility research phase as part of the 2014 American Conference for Information Systems (AMCIS). It has proved to be helpful for the overall understanding of the present state of the art in the IS domain in regards to the literature related to M&A.

The earlier versions of this paper were presented at academic conferences for discussion and feedback. The final version of the paper is the aggregated work of two literature studies conducted sequentially. Following the initial review of the literature, there was a need to further investigate the theoretical foundation, the maturity of the theories developed, and the gaps in the research discourse. The findings of the paper opened up an opportunity to examine, in detail, the digital-technology industry. The research findings also illuminated the need for more empirical case studies to further mature the research body, which had predominantly relied on secondary research.

Paper 2: "Expanded Understanding of IS Related Challenges of M&A: Methods & Research Context"

Organizational mergers and acquisitions (M&A) occur at an increasingly frequent pace in today's business environment. Accordingly, M&A have increasingly attracted attention from the information-systems (IS) domain. This emerging line of research is a result of recognizing that these

challenges are worsening IT-integration results and recognizing the requirements necessary for participating organizations to address these challenges. The extant literature has two limitations; the first limitation is that it has studied IT issues in M&A in a limited set of industrial domains. The second limitation is that it has relied almost exclusively on two research methods: case studies and surveys. This research has the potential to improve our understanding of challenges and solutions in M&A activity.

In this paper, the author adopted the focus-group gathering technique (a new method). This is a 'less-structured' focus-group process that utilizes the KJ method[32] for analysis. The KJ method involves the systematization and converging of brainstorming and is a cooperative work method aimed toward gaining insights into the issue. The KJ method consists of four steps which were employed by the researcher in the focus group. This was done as part of the engaged-scholarship research process to

[32] The KJ-Technique: A Group Process for Establishing Priorities - http://en.wikipedia.org/wiki/Jiro_Kawakita

elicit input from key informants who are working in a new industry that is facing challenges that are potentially divergent from what is currently detailed in extant literature. Given the previous focus on low-technology industries, the author focused on digital-technology companies as the research context (new industry domain) since they represent an unexplored industry with the potential for new knowledge as identified in research publication #1.

Results: The findings from the focus group suggest a significant area of firm-level issues that pertain to the area of offerings and development as well as to the diagnosis knowledge domains of an acquisition. Specifically, the areas of R&D team integration, sales enablement, new business models, and the go-to-market/product-life-cycle were highlighted as well as the structural fit and target state. Each area has a significant impact on IS managers and these five areas represent gaps in the extant literature.

The research presented in this paper is an initial step in the direction of extending the research

agenda on IS issues in M&A. It is motivated by the gap identified in research publication #1 and acknowledges that the high-tech industry is underrepresented and that further research in this area could reveal new areas of research.

Relation to the whole: This paper was written during the explorative phase of the research process. Following the findings from the literature review on information systems in M&A, it was a natural next step to go deeper into the digital-technology industry to understand the M&A process in this domain. The research was explorative and sought to understand the phenomenon better by utilizing focus groups and key-informant interview techniques to capture rich descriptions of the phenomenon from practitioners. The theoretical base for this paper was primarily IS in M&A. Since the goal was to let the insights and learning emerge naturally, the literature was used as seed categories instead of as a solid theoretical foundation. The analysis revealed several new insights that revealed gaps in the current literature.

Paper 3: "Technological Integration of Acquisitions in Digital Industries: A Case Study"

Acquisitions have become essential tools to retain a technological edge in digital industries. This paper analyses the technological-integration challenges in such acquisitions. Acquirers in digital industries are typically platform leaders in platform markets. They acquire (a) other platform providers to extend their platform core and to derive network effects by consolidating platform user groups, and (b) to complement providers by creating monopoly positions for the complements and for innovation complementarity. To enable these acquisition benefits, acquirers face technological-integration challenges in both process and product integration.

Results: Through a case study of Cisco, a Fortune 500 company that has acquired more than 175 business units, we develop four propositions explaining how the benefits of platform core and complement acquisitions are contingent in different ways on technical process and product integration.

Relation to the whole: This is the first of two papers written during the focused phase of the research and followed a different thread which was identified from the focus group and key-informant interviews. These interviews brought out the challenges faced by large multinational serial acquirers who compete as platform-based organizations. The paper findings make clear the different challenges and processes necessary for value creation in platform organizations as they acquire core versus component acquisitions.

Paper 4: "Sustaining an Acquisition-Based Growth Strategy: The Use of EA at Cisco"

Value-creating acquisitions are a major challenge for many firms. Our case study of Cisco Systems shows that an advanced enterprise-architecture (EA) capability can contribute to the acquisition process by a) preparing the acquirer to become 'acquisition ready', b) identifying resource complementarity, c) directing and governing the integration process, and d) evaluating the achieved integration and proposing ways forward. Using the EA capability in the acquisition process improves

Cisco's ability to rapidly capture value from its acquisitions and to sustain its acquisition-based growth strategy over time.

Results: The research findings reveal several important benefits of applying an advanced EA capability in acquisition as part of an innovation-based growth strategy. Our findings suggest that EA can contribute to the performance of integration in the following ways:

Speed (time to capability): The re-use of the current capabilities in-house at Cisco allows the company to get its products, services and solutions to market and orderable faster.

Reduced integration cost (re-use): The ability to support the integration of new business models and technologies with current operational capabilities. This eliminates the need for redundant capabilities.

Reverse integration: The ability to identify business or operational capabilities in the target company that can be scaled inside Cisco.

Furthermore, our analysis reveals that long-term organizational performance and sustainability of the acquisition program is impacted through the following:

Reduced IT complexity: Through the ongoing documentation of the current state of the enterprise, redundant and unused assets are identified and made obsolete which in turn sustains a flexible organization.

Fewer simultaneous projects: The rapid integration process means that Cisco can avoid the additional challenge from running a large number of acquisition-integration processes in parallel.

Synchronization with other transformation initiatives: The EA team orchestrates parallel integration processes with other transformative initiatives, enabling the firm to evolve as a coherent whole.

Relation to the whole: This is the second of two papers written during the focused phase of the

research. Following the insights from the focus group, the author chose to pursue a specific case study for the purpose of explicating the challenges faced by all the key-informant interview representatives—the challenge of integrating capabilities across an enterprise. This paper follows the research thread to a specific representative serial acquirer in the digital-technology company and highlights how enterprise architecture assists in the planning, execution and operationalization phases of an acquisition.

7.3 The Praxis of the Joint Publications

Publications #1, #3 and #4 are joint publications written with two professors in information systems (Phillip Yetton and Graeme Shanks), and one of two academic supervisors for this research (Stefan Henningsson). The actual distribution of efforts in regards to conducting the research, scoping the publications, and writing up the publications is provided in Table 8. The author did the largest part of the writing, except in paper 3, where the major part of the writing was done by the co-supervisor (Stefan Henningsson). The information in paper 3

was based primarily on my research, and I had a very significant role in the scoping of the article. In publications #1 and #4, the workload was more evenly distributed between the dissertation author and the academic colleagues. This collaboration focused the studies and brought direction to the studies and methods in the writing process. Furthermore, publications #2 and #3 were developed with the support of two practitioners from the primary case company. These practitioners provided insights and reflections throughout the research process, but they were not participants in the research and writing process. Working with the practitioners greatly improved the conditions for producing a reflective understanding of the digital-technology acquisition, specifically the technical-integration process, and the practical challenges. The following table details the praxis of the three joint publications and the single authored publication.

Dissertation Publication	***Contribution***	***Dissertation author***	***Co-Authors***
Taking Stock and Looking Forward: Information Systems Integration in Mergers and Acquisitions	*Research*	*60%*	*40%*
	Scoping	*50%*	*50%*
	Writing	*50%*	*50%*
Expanded Understanding of IS Related Challenges of Mergers & Acquisitions: Methods & Research Context	*Research*	*100%*	*0%*
	Scoping	*100%*	*0%*
	Writing	*100%*	*0%*
Digital platform acquisitions: Value creation and technological	*Research*	*70%*	*30%*
	Scoping	*50%*	*50%*
	Writing	*30%*	*70%*

integration challenges			
Sustaining an acquisition-based growth strategy: The use of Enterprise Architecture at Cisco Systems	*Research*	*80%*	*20%*
	Scoping	*50%*	*50%*
	Writing	*50%*	*50%*

Table 8. Co-authorship of the joint publications

The publications in this research dissertation follow Gregor's taxonomy of theory development (Gregor, 2006). First, a review of the current literature to uncover potential gaps and research opportunities aimed at analyzing the situation. Second, an explorative examination of the current challenges faced by practitioners in the process of technology-related integration and key informant interviews with the purpose of explaining the phenomenon further. Third, a rich case description of one exemplar company engaged in the integration process of digital technologies was developed with the purpose of explaining and

predicting. Fourth, an in-depth analysis and examination of the use of enterprise architecture as a method to sustain an acquisition-based growth strategy and extract value faster, which resulted in the design of prescriptive methods and lessons learned for practitioners with the intent to inspire action.

8. Contribution to Research and Implications for Practice

Across the four individual scientific publications outlined in the previous section, this section summarizes the contributions to research and recommendations for practice. As outlined in the previous chapters, the research process and the findings demonstrated that current understanding of how companies in the digital industry are pursuing innovation-based technology acquisitions is not adequate. We need a better understanding of this phenomenon by *exploring the unknown* and seeing the role of information systems in an entirely new and novel way. In addition to understanding the

phenomenon and the inherent challenges, we were able to identify potential methods and techniques for overcoming these challenges. Thus, the results of this research provide new insights for both research and practice on how to improve the process of technological integration of innovation-based acquisitions in the digital-technology industry.

The following two sections, 6.1 and 6.2, summarize the four scientific contributions to the contemporary information systems, enterprise architecture and technology-platform literature domains. The following section outlines the contributions to practice and indicates the uptake and the continuous methods and techniques which are emerging as the best practices to overcome challenges with technology integration in digital industries. Four recommendations for practice are also made and are based on the research contributions.

8.1 Contributions to Research

Contribution #1: Managing the Known and Exploring the Unknown: IS in M&A Literature

The literature review (research publication #1) published during the feasibility phase of the research contributes to research by reviewing and documenting the current state of the art of IS literature in M&A. The review of the state of the art of IS in M&A revealed some significant gaps which were used to motivate this thesis project.

Two distinct contributions were produced from the initial research publication. First, previous to this research project, a systematic review of the extant literature had not been done. The research publication identified forty-seven research papers in fourteen IS journals and four IS conference proceedings. Considering the current state of art in this research area, the timing of a systematic review was appropriate. The literature review gives the research community the opportunity to direct its attention to specific areas of focus and motivates the research to move from the predominant theories

of analysis, explanation and prediction (thirty-five papers combined) towards theoretical contributions, such as theories for explaining and predicting (six papers) and theories for design and action (six papers) (Gregor, 2006). In addition to the theoretical contribution, this review serves as a base for contributions from other researchers given that several gaps were identified.

The second contribution is a set of recommendations to advance the research field. Based on the results of the systematic review of the literature, there are two clear research threads that can be further explored. The first thread should aim to deepen the existing research focus by developing existing analytical and explanatory theories of IS integration in individual acquisitions towards predictive and actionable theory. The second research thread leads to the focus on IS integration in acquisition programs by serial acquirers, mergers of large MBOs, and acquisitions in high-tech industries driven by access to technology innovations and innovative capabilities.

Contribution #2: Expanded Understanding of IS-Related Challenges in Digital-Technology Industry M&A

The empirical work and the paper published during the explorative research phase (research publication #2) encapsulated this contribution to research. The findings from the focus groups suggest a significant area of firm-level issues that pertain to the area of offerings and development as well as the diagnosis knowledge domains of an acquisition. Specifically, the areas of R&D team integration, sales enablement, new business models, and the go-to-market were highlighted as well as the structural fit and target state. Each area has a significant impact on IS managers and the five areas represent gaps in the extant literature. The research contribution based on the findings in the second research publication is an initial step in the direction of extending the research agenda on IS issues in M&A. It is motivated by the gap identified in research publication #1 and acknowledges that the high-tech industry is underrepresented and that

further research in this area could reveal new areas of research.

The research approach used in the explorative research phase yielded several findings not yet evident in the extant literature. While evident in the digital industries, some are likely generalizable beyond these industries. The most important areas for researchers to investigate are *new business models* and *go-to-market*. These are areas in which several of the organizations engaged in this part of the research project identified as a central challenge. When asked, they used the term "acquire and integrate innovations" as an analogy to adding digital acquisitions to their product portfolio by acquiring small companies for "tech and talent." In many cases, these acquisitions represented new or adjacent business models to the core product portfolio along with different go-to-market models that included new pricing and billing models, such as pay-per-use or software-subscription models. The associated IS challenges are linked to the firm-level issues given that the IS integration team must overcome the challenges of integrating these new

capabilities that support the new business models into the current architecture. While this challenge is evident in the digital-technology industry, it is likely also a challenge that is generalizable to many other industries that depend on technology to provide solutions to its customers and where disruption and innovation-based acquisition are evident (i.e. biotechnology, pharmaceutical, and energy industries).

Two additional future research streams were identified, *sales enablement* and the *integration of research and development teams*. Both of these are a considerable challenge and there are clear gaps in the extant literature as far as IS challenges in M&A are concerned. Sales enablement is the ability to bring the product to a new market segment or to capitalize on bringing an existing customer base to a new product offering. According to the key informants and focus-group participants, this depends largely on the ability to train the sales force of an organization. Of particular challenge are business processes and systems issues as they relate to the area of sales compensation. A related

challenge, connected to the impact on the product offerings, is the integration of research and development teams. In digital-technology industries, the impact of integrating the R&D team into the acquiring entity is critical to the ability to attain value from the acquisition. This could be either as an early-stage product which is under development or as a mature product being integrated into another offering. These two areas are an under-researched area in the extant literature on IS in M&A and could be a useful thread to further develop. In regards to generalizability, the two future research streams are both associated with the digital-product offering being integrated and, therefore, potentially unique to the digital-technology industry. However, as technology becomes more integrated in the product offerings of industries that are not in the digital-technology industry (i.e. retail, transportation, and financial services industries), this is likely a challenge they will also have to overcome both at the firm level and the IS level.

Contribution #3: Technological Integration Challenges in Digital-Platform Companies

Our research contributes to the intersection of two emerging streams. The first of these streams focuses on technological-integration challenges in acquisitions. We previously addressed technical-process integration challenges in industries organized as value chains and value shops. According to findings in research publication #1, digital industries represent an unexplored industry with the potential for new knowledge creation about acquisition challenges.

The second stream focuses on strategic management in industries organized as platform markets. In this stream, scholars have shown increasing interest in how platforms evolve over time (Gawer, 2014) and how companies can enact corporate strategies in platform markets (Boudreau, 2010; Eisenmann et al., 2011). From the viewpoint of this stream of research, the prospect for and challenges to acquisitions in platform markets is unexplored ground.

Thus, within this intersection of the literature, we analyze the technological-integration challenges in platform markets. This work contributes to research through the development of four propositions on the technological-integration challenges in such acquisitions.

Integration challenges in suiteing acquisitions

- P1. Suiteing acquisitions are, with respect to offering integration, concerned with the speed of integration to get the 'time to *orderability'* of the new modified product to the market.
- P2. Suiteing component acquisitions are, with respect to operational integration, focused on realizing efficiencies and ensuring that the acquired technology is supported by the necessary capabilities as it is brought to scale across the platform.

Integration challenges in coring acquisitions

- P3. Coring acquisitions are, with respect to offering integration, less of an initial focus

since the acquisition company likely has a well-established product, and the technical integration can be done over time and with customer input.

- P4. Coring acquisitions are, with respect to operational integration, critical to focus on since the acquisition company typically brings associated capabilities that need to be retained in order to leverage acquisition benefits.

These propositions advance the understanding of the challenges facing value-creating acquisitions and can serve as research platforms for researchers in both domains (information systems and strategic management) to further explore and explain the phenomenon.

Contribution #4: Enterprise Transformation Enabled by EA: Sustaining an Acquisition-Based Growth Strategy

The case study and the first paper published during the focused research phase (research publication #4) detail the role of enterprise architecture (EA) in

the different phases of acquisition integration (pre-acquisition preparation, acquisition selection, acquisition integration, and post-integration management). The research integrates two domains of research and exposes the benefits of leveraging the EA function in all four phases of an acquisition. Acquisitions of other business units is a common, but challenging, component of many firms' corporate growth strategies.

The research findings from the case study of Cisco revealed several new insights into how EA can be leveraged to attain value creation and increase the speed to market of an acquisition integration. EA capability enables Cisco to enhance its acquisition process through the lens of its business and operational capabilities, systems and technologies. This allows the acquisition team to plan, execute, and evaluate acquisitions within a strategic-planning framework that improves acquisition performance without compromising organizational performance. Specifically, using an organization's EA capability improves acquisition performance through speed (time to integration capability),

reduced integration cost (reuse), and reverse integration.

The research findings also showed that long-term organizational performance and sustainability of the acquisition program is impacted through reduced IT complexity, fewer simultaneous projects, and synchronization with other transformation initiatives. The insights from this research opens up a new set of research opportunities in the intersection of IS, M&A and EA.

Summary of Research Contribution

The investigation and research into the digital-technology industry was an exploratory process with the aim to open up the aperture of IS research in M&A. It was, therefore, the ambition to primarily contribute to this with theories for analysis and explanation (Gregor, 2006) in research publications #1 and #2. Research publications #3 and #4, both written during the focused research phase, are closer to theories of explaining and predicting (Gregor, 2006). The latter type of

theoretical contribution is still lacking a substantial body of knowledge as identified in part by the gaps discovered when researching publication #1.

When viewed holistically, the contributions to research can be seen as ‘blue ocean’ theorizing. It is the ambition of the researcher to open up the addressed domains by exploring the known phenomenon of IS integration but in the novel context of digital-technology companies (the unknown). It is, however, based on a significant body of previous knowledge (information systems, technology platforms, mergers and acquisitions, and enterprise architecture) which ensures that it connects with well-explored phenomenon (the known). The novelty of this research project and its contributions relate to the fact that it investigates the intersection of a multiple of these domains throughout research publications #1–4. The contributions are primarily targeted towards the information-systems domain through the systematic review of all current literature on IS in M&A as well as opening up new research agenda for digital-technology industries engaged in

innovation-based acquisitions. Additionally, the research publications contribute to the secondary research domains as well by weaving together the domains in a new and novel way. Table 9 shows how each contribution is linked back to the research publications.

#	*Summary of the contribution to research*	***Dissertation Publications***
1	**Information-Systems Research in M&A Literature: Managing the Known and Exploring the Unknown**: Deepens the existing research focus by developing existing analytical and explanatory theories of IS integration and focuses on IS integration in acquisition programs by serial acquirers, mergers of large MBOs, and acquisitions in high-tech industries driven by access to technology innovations and innovative capabilities.	*#1*
2	**Expanded Understanding of IS-Related Challenges in Digital-Technology Industry M&A**: Expands the research agenda with new areas for investigation in innovation-based acquisitions by	*#1, #2*

	digital-technology companies. This includes research in R&D and sales-related firms as well as IS-level challenges.	
3	**Technological-Integration Challenges in Digital-Platform Companies**: Four research propositions based on findings from Cisco. These lead to opportunities for research on how platform companies create value from suiteing and coring acquisitions.	*#3*
4	**Enterprise Transformation Enabled by EA: Sustaining an Acquisition- Based Growth Strategy**: New insights into how EA can be leveraged to attain value creation and increase the speed to market of an acquisition integration.	*#4*

Table 9. Summary of the contribution to research and associated research publications

8.2 Implications for Practice

As this is a practice-based PhD, there are numerous significant implications to practice. Several of these implications are captured in research publications #3 and #4. The following section is intended to expand on these implications and draw on all

papers to bring together additional implications for practice that have emerged from the research publications. To clarify these recommendations, they have been detailed in the following four implications along with relevant quotes from some of the informants and advisers as part of this research project. Following the recommendations is a table indicating how the recommendations tie back to the research publications. In a later section, each implication is connected to the research questions for this research project.

Implication #1: The Changing Role of the CIO—Chief 'Integration' Officer

The role of the CIO is fundamentally changing due to changes in digitization and consumerization of technology[33]. As the role of technology continues to impact the core business functions of enterprises in every industry, a strategic choice needs to be made by the CIO. The key choice is whether to be a strategic leader and integrator of technologies in

[33] Forbes - Consumerization Of IT: Is Your CIO Ready - www.forbes.com/sites/netapp/2013/11/04/consumerization-second-wave/

the differentiating, or competitive areas, of the enterprise or to be a core-services technology provider. Following the latter strategy, the IT organization is often separated from the company it serves and confined to core services such as enterprise-resource planning (ERP), transaction management, networking, or security. Even CIOs who have IT staff working as analysts in business units tend to view technology in an isolated way. This focus on the core, whether the result of management priorities or the CIO's own agenda, warps the CIO's view and divorces the CIO from all the value-creating activities that happen in business units, such as sales, marketing, product development, customer support, distribution, and production.

Even a good CIO might get that isolated because the nature of the core focus makes it difficult to have a deep view of the whole enterprise, especially those top-line activities that CEOs so much want to tap to gain revenue. Technology companies, VMware and Cisco, are both examples of companies were the CIO role is changing. The

former CIO of VMware, now the CIO of the United States, reflected on this change in a blog posting from 2014:

> *"At VMware, we already support an integrated IT model, embedding business relationship managers from IT within all our lines of business. These managers hold the responsibility for driving business success and enabling enterprise innovation. The only way they can do that is to be an integral part of the organizations they represent. This way, IT can lead with the business by truly enabling business success and driving technology solutions that focus on business outcomes.[34]" - Tony Scott, Former CIO, VMware*

This shift in the role that the IT department plays also influences how the integration of new technology acquisitions are embedded into the business models of the enterprise. This shift in

[34] http://blogs.vmware.com/cio/2014/07/transformation-time-new-mental-model.html

responsibilities will challenge the traditional IT leader and CIO to rethink the role they play in the acquisition-integration process. Their knowledge of how the integration of technology relates to business processes is no longer sufficient and it likely to be considered *table-stakes* as business-unit leaders will look to the CIO to advise them on the integration of the digital technologies in the product offerings.

> *"Today, the CIO influences and impacts every part of what we do as a business. That also means finding the right CIO has become a challenge. Companies want someone who understands both the technology landscape and the business implications of technology.[35]" - Chris Patrick, Global Lead, Egon Zehnder's CIO practice*

The challenge for CIOs to reinvent their roles and the value they bring to an organization is significant, but is also an opportunity. With the

[35] http://www.cio.com/article/2691752/cio-role/how-the-cio-role-is-changing-as-business-needs-evolve.html

elevation of the role of technology from traditional core-company processes (ERP) to the inclusion in a company's product offerings, the role of the CIO is changing from being one of supporting corporate processes and managing a cost center to one of advising and consulting on product strategy where technology is a key component. This is true at Cisco where the CIO and her leadership team engage directly with business-unit leaders on product strategy while continuing to manage the IT infrastructure allowing the CEO to keep up with the change in pace in the technology industry.

Implication #2: Innovation-Based M&A—A New Type of Growth-Based Acquisitions

Based on the findings in both research publications #1 and #3, it is evident that both in literature and practice, there is a gap in knowledge and practical know-how regarding how to manage and derive value from innovation-based acquisitions. The process of integrating technological innovation in digital-technology companies was specifically made evident in the focus groups. The evidence found through the focus groups can most easily be

summarized by Albert Einstein's definition of insanity: seeking the answer to something new and novel, yet following the same approach as before. The same is true for M&A leaders in digital-technology companies attempting to integrate a different technological product offering into an enterprise that is primarily made up of different technological product offerings. This is particularly true for companies like Cisco which, based on its historical technological product offerings, is predominantly a hardware company. Yet, it is aggressively acquiring and integrating software and security companies.

Software vendors like Autodesk and Adobe also face this challenge in a slightly different manner. Historically being companies that sold software in cardboard boxes through brick and mortar outlets, they are now not only selling the software directly to the consumer via their websites but are also moving into subscription-based product offering where the consumer only pays for the software when used and can startup and shutdown their use at any time and on demand.

M&A leaders need to rethink the mental models they use for these types of disruptive and non-similar product offerings when they attempt to integrate them. Following conventional wisdom and models will likely not result in the realization of the type of value the acquirers were hoping to gain.

Implication #3: Technological Integration in Platform Industries—A Strategic Capability for Growth

The knowledge advancement presented in research publication #3 should be of great value for the many acquiring companies in the digital industry. Many of these industries are involved in an "innovation arms race" where technological innovations provide transient advantages that are quickly eroded by new technological innovations. Technological innovation is, however, difficult for mature and rigid companies (Kogut & Zander, 1992; Nelson & Winter, 1982; Dierickx & Cool, 1989). On the other hand, acquiring technological innovation and related capabilities is not easy either. The findings of this research may help

prospective acquirers to better analyze the value potential of technology acquisitions and the integration challenges that may inhibit value creation.

The findings related to *coring* and *suiteing* acquisitions originate in the exploration of Cisco but examples of the value mechanisms from other digital platform owners are present in the public domain. The coring acquisition strategy can be compared with Apple's, Google's, and Microsoft's frequently employed strategies to acquire innovative technologies in order to strengthen their respective platforms. Coring acquisition answers one of the enduring challenges faced by platform owners: to relentlessly innovate the platform core in an effort to drive the technological trajectory of the overall technological and business system of which the platform is a core element (Gawer, 2014).

Also, suiteing acquisitions have the possibility to become an essential strategic tool for companies in software industries. For VMware, the ability to

create suites of complementary products is the key driver for acquisitions:

> *"Through strategic acquisitions, we can expand and enhance our product lines to offer full suites of products that deliver a more dynamic, scalable, integrated, and efficient architecture. With less time and money spent integrating, running, and supporting underlying IT infrastructures, customers can focus on efforts that yield greater business and competitive value[36]" - Tony Scott, Former CIO, VMware*

The findings of this research may also assist companies in avoiding problems. As stated by Wijnhoven et al., (2006, p. 25), "the avoidance of problems is of the greatest value to practice." Research on integration has shown that by preparing the acquirer to be 'ready to acquire', the acquirer can avoid many technological-process-integration problems (Yetton et al. 2013).

[36] https://www.vmware.com/company/acquisitions

The research in this project also indicates that for acquirers in digital industries, it is of equal importance to prepare the products for acquisition integration in order to avoid product-integration problems. Cisco's CEO, John Chambers, understood how to prepare his organization and leaders better than most. He was clear on the need to anticipate what he calls *market transitions* and to ensure that his team was ready to acquire at the same time. In a 2015 *Harvard Business Review* article, he reflected on this in the following way:

> *"Our success at Cisco has been defined by how we anticipate, capture, and lead through market transitions. Over the years, I've watched iconic companies disappear—Compaq, Sun Microsystems, Wang, Digital Equipment—as they failed to anticipate where the market was heading.[37]" - John Chambers, CEO, Cisco Systems*

[37] https://hbr.org/2015/05/ciscos-ceo-on-staying-ahead-of-technology-shifts

Implication #4: Enterprise Architecture—Accelerate the Time to Value

Drawing on an advanced EA capability in the acquisition process can improve possibilities for acquisitions becoming value-creating and allows the business-unit leader or corporate-development teams to be proactive rather than reactive. If the purpose of EA in an organization is to enable the translation of strategic initiatives, based on a corporate vision, into executable components that can be measured and operated, then there is a high likelihood that it can have a meaningful impact on the ability for the organization to remain agile, responsive, and adaptive to a changing business environment. The key is to focus the efforts on the major business transformations and on developing models that translate strategy into execution which occurs 'just in time'.

The temptation is to create perfect architectures that have a high level of detail that may look optimal for the current situation, but are unnecessary at this stage of the transformation. The competition in the digital-technology market is

fierce and emerging-technology start-ups are sought after by many suitors. An example of this is the acquisition of Nicira in 2012 by VMware[38]. Nicira was a company offering software-defined networking to its customers. It was a competitive product offered to conventional hardware datacenter manufacturers. The company was approached by other likely acquirers, such as Cisco and other large hardware manufacturers, but in the end, VMware succeeded in its bid with a $1.2 billion offer. Understanding the gaps and opportunities in your product portfolio and the current market for emerging technologies can be the key differentiator to deriving value from an acquisition.

> *"Firms like Amazon and Google are very much in proactive deal mode. Proactive firms decide they want to be in an area, they survey the landscape and then decide whether they want to invest, partner or own,*

[38] https://www.vmware.com/company/news/releases/vmw-nicira-07-23-12

and what's actionable at what valuation.[39]*" - Michael Watkins, Harris Williams & Co.*

8.3 Summary of Recommendations for Practice

In the literature, as in practice, there is a good foundational knowledge base on the process of acquiring and integrating companies when the acquisition strategy is following the traditional ambitions for scope and scale. The findings from the research show, however, that practitioners struggle with the process of acquiring and integrating technology product offerings. This is particularly true in the digital-technology industry when dealing with innovation-based acquisitions. The implications begin to identify these gaps and suggest two areas that practitioners might rethink their approach and enlist the assistance of the enterprise-architecture capability and resources to help manage the different phases of acquisition and integration found in different types of acquisitions. Following is a table that shows how each

[39] http://www.themiddlemarket.com/maj/2011_66/tech-deals-expected-to-heat-up-247558-1.html

implication is linked back to the research publications.

#	*Summary of the implication to practice*	*Dissertation Publications*
1	**The Changing Role of the CIO—Chief 'Integration' Officer**: The role of the CIO is fundamentally changing as the role of technology continues to impact the core business functions of enterprises in every industry; a strategic choice needs to be made by the CIO.	*#2, #3, #4*
2	**Innovation-Based M&A—A New Type of Growth-Based Acquisitions**: There is a gap in knowledge and practical know-how regarding how to manage and derive value from innovation-based acquisitions.	*#2*
3	**Technological Integration in Platform Industries—A Strategic Capability for Growth**: *Coring* and *suiteing* acquisitions are examples of the value mechanisms for digital platform owners to strengthen their respective platforms.	*#4*
4	**Enterprise Architecture—Accelerate the Time to Value**: Drawing on an advanced EA capability in the acquisition process can improve possibilities for acquisitions	*#3*

	becoming value-creating and allows the business-unit leader or corporate-development teams to be proactive rather than reactive	

Table 10. Summary of the implications to practice and associated research publications

9. CONCLUSION

This dissertation summary has outlined three years of research into the technological challenges facing digital-technology companies when acquiring and integrating innovation-based acquisitions. Forty-one interviews and three focus-group interviews were carried out as well as the analysis of a large amount of secondary data in order to understand the complex process of managing the challenges associated with technological integration of innovation-based acquisitions. Following the engaged-scholarship research tradition and using a combination of a systematic literature review, explorative focus groups, and case studies, we were able to answer the overarching research question. It also grounded theory using existing research on IS

in M&A, digital platforms, and enterprise architecture.

Throughout the research process, the theoretical abstractions and generalizations generated in regards to theory were presented at four peer-reviewed academic conferences (Publications #1 – AMCISC 2013, ECIS 2014, #2 – ECIS 215 and #3 – Academy of Management Annual Meeting) and two are now under review in scientific journals (Publications #1 and #3). These primary contributions are reported in the Appendix. The research publications have addressed the research questions initially constructed to guide the research. The following section is a review of how the overarching research question has been answered, how each research sub-question has been addressed, and how it connects to the contributions and implications above.

9.1 Overview of the results

Overarching research question: What are the technology-related integration challenges to

acquisitions in digital-technology industries and how can these challenges be managed?

RQ	Research question description	Where the research question is addressed		
		Research Publications	Contributions to research	Recommendations for practice
#1	What is the current state of the literature on information systems in M&A?	#1	#1	#2
#2	What firm-level M&A integration issues exist in digital-technology companies that can motivate an extension of the research agenda of IS in M&A?	#2	#2	#1
#3	How is technological integration realized in digital-platform acquisitions?	#3	#3	#3
#4	How can challenges of technological-innovation acquisitions be managed to sustain a growth by acquisition	#4	#4	#4

	program?			

Table 11. Connecting the research questions to contributions and recommendations

Sub-question #1: What is the current state of the literature on information systems in M&A?

The first research publication addressed this research question through a systematic literature review discussed in earlier sections. Research contribution number one summarizes the current state of the art and outlines the future research opportunities for this research.

The systematic review of the research in this domain has been an ongoing activity throughout the research project and has resulted in several iterations of the first research publication. The paper presented as part of this thesis represents the current state of the art. However, this is an emerging field and a growing number of researchers are contributing to the discourse on this subject.

Sub-question #2: What firm-level M&A integration issues exist in digital-technology companies that can motivate an extension of the research agenda of IS in M&A?

Research publication #2 addresses this question. The findings from the focus groups suggest a significant area of firm-level issues that pertain to the area of the offerings and development as well as the diagnosis knowledge domains of an acquisition. Specifically, we highlighted the areas of R&D team integration, sales enablement, new business models, and the go-to-market/product-life-cycle, as well as the structural fit and target state. Each area has a significant impact on the IS managers and the five areas represent gaps in the extant literature. The research findings also propose avenues for further research.

Sub-question #3: How is technological integration realized in digital-platform acquisitions?

Research publication #3 addresses this research question specifically. The findings suggest that acquisitions have become essential tools to retain a

technological edge in digital industries in which acquirers in digital industries are typically platform leaders in platform markets. Based on the research findings, four propositions emerge seeking to identify answers to the research question. These explain how the benefits of platform core and complement acquisitions are differently contingent on technical process and product integration.

The findings of this research may help prospective acquirers to better analyze the value potential of technology acquisitions and the integration challenges that may inhibit value creation. The findings related to coring and *suiteing* acquisitions originate in the exploration of Cisco but examples of the value mechanisms from other digital-platform owners are present in the public domain. The coring acquisition strategy can be compared with Apple's, Google's, and Microsoft's frequently employed strategies to acquire innovative technologies in order to strengthen their respective platforms. The coring acquisition answers one of the enduring challenges of platform owners: to relentlessly innovate the platform core to drive the

technological trajectory of the overall technological and business system of which the platform is a core element (Gawer, 2014).

Sub-question #4: How can the challenges of technological-innovation acquisitions be managed to sustain a growth-by-acquisition program?

Research publication #4 highlights specific benefits that a digital-technology company has seen from engaging enterprise-architecture resources in the processes of M&A. The contributions to research are highlighted in contribution #3 and the recommendations for practice are highlighted in recommendation #2. The EA practice contributed to the pre-acquisition preparation of the firm in a number of ways. EA helped the firm be 'acquisition ready', helped with target selection by showcasing resource complementarity, helped acquisition integration by directing efforts towards desirable target states, and helped post-integration management by guiding corrective action to ensure the success of the long-term growth strategy. EA capability enables the company to enhance its

acquisition process through the lens of its business and operational capabilities, systems, and technologies. This allows the acquisition team to plan, execute, and evaluate acquisitions within a strategic planning framework that improves acquisition performance without compromising organizational performance. In answer to the research question, drawing on an advanced EA capability in the acquisition process can improve possibilities for value-creating acquisitions. If the purpose of EA in an organization is to enable the translation of strategic initiatives, based on a corporate vision, into executable components that can be measured and operated, then there is a high likelihood that it can have a meaningful impact on the ability of the organization to remain agile, responsive and adaptive to a changing business environment.

Taken holistically as a set of interdependent research questions assembled to answer the overarching research question (What are the technology-related integration challenges to acquisitions in digital-technology industries and

how can these challenges be managed?), the author concludes that the research question has been sufficiently addressed through the undertaking of the research project given the research phases and research experiences as well as the contributions and recommendations as a result of the four research publications.

9.2 Limitations of the Research

Upon answering the initial research questions, it is critical to address the limitations of the research and identify any future research topics based on the findings from the research publications and this cover manuscript. As with most applied research in the social sciences, this research also has its limitations. Perhaps, the most immediate limitation relates to the ability to generalize the findings across industries beyond the digital-technology industry and national borders. The specific time, place, and environment for the conduct of the research makes it context sensitive, and the generalizations that can be made from case-study research like this are, therefore, limited (Patton, 2001). This critique stems from positivistic science,

which considers scientific knowledge to be obtainable from sense data that can be directly experienced and verified between independent observers to develop generalizable results (Susman & Evered, 1978). Other methods and research paradigms could be useful to confirm the understanding of EA adoption in government under other epistemological assumptions.

The findings presented in the four publications mostly represent 'snapshots' of the innovation-based M&A process in practice. Little could be reported about the longitudinal impacts of the phenomenon studied, and it is, therefore, possible that some idiosyncratic aspects in the particular organizations studied are not included in the analysis. The emergent understanding of the innovation-based M&A process and the inherent challenges of technological integration developed in the three research phases could perhaps have been organized more explicitly at the beginning of this research. And the sequential analysis of the cases may have affected the reported findings. However, this research represents a reflective and

inductive learning process where practical experiences, research findings, and theoretical generalizations have shaped the understanding of the technological-integration process and the challenges in innovation-based M&A presented.

This research has not aimed at the creation of generalizable facts in the form of homothetic natural laws. Based on the rich case studies, the aim has been to produce theoretical abstractions and generalizations that can be related back to the case studies. The tentative prior constructs (Eisenhardt, 1989) or seed categories (Miles & Huberman, 1994) used to get a preliminary hold of the research field might have influenced the understanding developed here.

Finally, the selection of cases can furthermore be criticized for not meeting the criteria of 'theoretical saturation' (Glaser & Strauss, 1967). As pointed out by Eisenhardt (1989), theory can always be developed further, but time and money normally poses some restrictions and, in practice, only a limited amount of cases can be studied.

9.3 Future Research

The opportunities for future research topics are extensive. The systematic literature review provided a fertile ground for not only this research project but also for many other research streams to be built. The future research from this publication is split into *managing the known* and *exploring the unknown.* In *managing the known* there is a need to move from the understanding of single acquisitions and mergers towards theories for prediction and action. A first step is further conceptual refinement. Distinguishing between acquisitions and mergers is only a first step. There is a need to further explore how the known issues impact different types of mergers and acquisitions. For example, identifying the relative importance of alignment in acquisitions driven by economies of scale or scope compared with acquisitions driven by innovation is one area that could be explored further.

In addition, following the Gregor (2006) taxonomy of theories, there is a clear need to advance from explanation and prescription to action. In *exploring the unknowns,* there is a need to expand the path of

research to the exploration of the many unknown facets of the phenomena. The review of extant research in research publication #1 identifies a long list of potentially interesting aspects, including acquisition programs, acquisitions of and mergers between MBOs, serial acquirer challenges and opportunities, vendor and target pre-acquisition preparation, technology acquisitions driven by innovation potential, acquisitions by platform organizations and companies competing with system-based offerings, antecedents to IS integration capabilities, and how engaging in M&A impacts general IS capabilities.

Future researchers can approach these unknown aspects of IS integration in M&A through three broad streams of research directed towards three empirical phenomena that have received little attention in the extant research: serial acquirers and acquisition programs, mergers and acquisitions between MBOs, and further development of theory in innovation-driven acquisitions.

Based on a deeper understanding of the technological-integration challenges faced by M&A managers in digital-technology companies, as detailed in research publication #2, there is an opportunity to move from the exploratory methods used to analyze and document the challenges to developing theories for explaining, predicting and eventually to design and action. Specifically, future research could be developed following the gaps in IS literature in the areas of diagnosis (structural fit and target state), product-offering integration (new business models and the go-to-market) and development (R&D team integration, sales enablement) as well as the associated challenges described in detail in research publication #2.

Building further on the understanding of technological integration, there are multiple future research opportunities as a result of the research in this dissertation in the area of digital-platform leaders and how acquisitions are managed in these types of companies. To the author's knowledge, there are only a few examples of acquisitions by platform-complement providers and acquisitions by

platform leaders are under-researched. However, subsequent research should seek to extend the knowledge about acquisitions in platform markets to other actors of the platform ecosystem.

In the focused research phase of this dissertation, the author investigated the use of enterprise architecture within a large digital-technology company. The focus was on the use of enterprise architecture as a management tool to guide enterprise transformation and, specifically, in the use of acquiring and integrating innovation-based companies. Research publication #4 provides a very rich description through a case study of the use of EA in Cisco to overcome several challenges associated with this type of technological integration. The case study of Cisco Systems shows that an advanced enterprise-architecture capability can contribute to the acquisition process through several distinct activities while providing the ability to rapidly capture value from acquisitions and to sustain its acquisition-based growth strategy over time. Future research can build on this individual case study and expand to compare

multiple cases across several companies in order to compare and contrast different approaches and techniques.

Also, the use of enterprise architecture is pervasive within the digital-technology industries and is traditionally viewed as a technology-transformation technique. It is also used outside of these industries and is used as an enterprise-transformation management tool similar to the way it is used within Cisco. Future research can, therefore, also extend into the use of EA within these industries as they manage IS-integration challenges.

9.4 Reflections, lessons learned and epilogue

This dissertation research has sought to explore and understand the important questions that practitioners face in their work with innovation-based M&A in the digital-technology industry. Putting theory and practice in relationship with each other is not an intellectually cognitive activity that can be constructed in the head of one person; rather, it is an embodied relational activity that necessitates bringing members of scholarly and

practitioner communities into conversation with one another (Van De Ven, 2007). Many of the recommendations and statements in this research have already been embraced in the United States by the M&A and the enterprise-architecture teams at Cisco as well as M&A leaders in several of the companies that collaborated throughout the research project and consultants who advise digital-technology companies on their M&A strategy.

Hopefully, the application of the dissertation research's contributions can benefit the ongoing improvements in methods of overcoming the challenges with technological integration of innovation-based acquisitions. All too often, scientific and practical knowledge tend to be viewed as mutually exclusive with scientific knowledge occupying a privileged position. This research illustrate the value of a dialogue with practitioners that enriches the research process and hopefully produced relevant contributions to practitioners in digital technology industries as well as the academic community.

As an engaged-scholarship researcher within the digital-technology industry, I have learned several valuable skills. As a practitioner, it is very easy to see the daily challenges and opportunities as an occasion to bring value to an organization by solving the challenges and exploiting the opportunities at a localized level. The challenge, however, is to move beyond the localized and immediate solutions to these challenges and opportunities and take a theoretical and broader view of the phenomenon in an effort to elevate the viewpoint of the observer and the phenomenon to an industry and theoretical level.

The acquisition-integration process within Cisco is not my core responsibility, but I am a primary stakeholder since the contributions of the EA team enables the process (described in research publication #4). Through this process, it is clear that the ability to see the local phenomenon at Cisco, and across the digital-technology industry as a whole, has given me the ability to reflect more deeply on the underlying root causes of the challenges rather than the apparent symptoms.

Given my role as a researcher, the three phases of the research have also allowed me the opportunity to start the process from the viewpoint of the extant literature rather than from the apparent challenges faced by practitioners. The value of starting with a well-rooted foundation in the literature was something that was not initially apparent to me. As a manager, I am rewarded for making fast decisions without having all of the needed information—a skill that has developed over time and takes confidence to use. As an engaged researcher and with the ability to interview industry informants and colleagues at Cisco, I was able to observe the process of technological integration at the product and process level.

Each research publication in this cover manuscript has been revised several times and each study, except research publication #2, has been published in at least two academic outlets. As a result of this process, the studies have undergone reviews by the study participants, academic collaborators, and other supporters of the project. Each revision and iteration has served the purpose of bringing the

collective knowledge of the academic collaborators closer together as well as serving as a way to motivate practitioners to continue to collaborate further in the process. Several focus-group members helped with content as well as with guidance on research publications #3 and #4. This interplay between researchers and group members has been a very rewarding experience and is one that will result in benefits to both groups beyond the life of this research project.

Following the engaged-scholarship diamond and iterating between model, solution, reality, and theory turned out to be a very effective way of tying together the input, advice, and guidance from M&A managers, academic stakeholders, and collaborators in regards to the development of research publications #2, #3, and #4. The continuous feedback and reflection on the results of each publication through reviews with the focus-group participants of research publication #2, the key informants in research publication #3 and the case-interview participants in research publication

#4 was a great way to accomplish three important steps in the engaged-scholarship process.

The challenge of engaging what is a very secretive group of practitioners, since the process of acquisition integration can be a competitive advantage, was significant. Acting as a liaison and agent of knowledge transfer between these practitioners was surprisingly welcomed by them. As intended by Van de Ven (2007), the goal is for scholars to develop and exploit new forms of knowledge production that facilitate and leverage interactions between practice and theory to develop scientific as well as practical knowledge. The M&A managers who were part of the focus group, the key-informant interviews, and the case interviews were not used to this level of engagement and saw it as an opportunity to not only share their own knowledge but also to learn from others in the study. It allowed me to bring other researchers into the collaborative research process in order to fulfill the goal of engaged research. This goal is best captured by Van de Ven as “a participative form of research for obtaining

the different perspectives of key stakeholders (researchers, users, clients, sponsors, and practitioners) in studying complex problems" (2007, p. 9).

Engaged scholarship is a skill that outlives the immediate research project and something that will help challenge me to see the immediate and obvious challenges and opportunities through a more reflective and theoretical lens, as well as to apply critical thinking and academic rigor to solving complex challenges.

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11. APPENDIX - RESEARCH PUBLICATIONS I-IV

Paper 1: Toppenberg, G., Henningsson, S. & Yetton, P. *"Taking Stock and Looking Forward: Information Systems Integration in Mergers and Acquisitions"*, Under review for European Journal of Information Systems (to be revised and resubmitted)

Paper 2: Toppenberg, G. *"Expanded Understanding of IS Related Challenges of Mergers & Acquisitions: Methods & Research Context",* Presented at European Conference for Information Systems 2015

Paper 3: Toppenberg, G. & Henningsson, S. *"Technological integration of acquisitions in digital industries: a case study",* to be presented at The 75th Annual Meeting of the Academy of Management

Paper 4: Henningsson, S, Toppenberg, G. & Shanks, G. *"Sustaining an acquisition-based*

growth strategy: The use of Enterprise Architecture at Cisco Systems", under review for Management Information Systems Quarterly Executive (second round)

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Taking Stock and Looking Forward: Information Systems Integration in Mergers and Acquisitions

Abstract

The last decade has seen a rise in research on the topic of information systems (IS) issues in corporate mergers and acquisitions (M&As). This research has the potential to significantly improve our understanding of challenges and solutions in M&A activity. However, still absent is the necessary step of consolidating and integrating extant knowledge. In this paper, we review the domain of research on IS integration in M&As, investigating the object of study, the research approach taken and theoretical developments through a scientometric analysis method. We identify and analyse 47 articles published in 14 journals and 4 IS conference proceedings. Based on the analysis we identify gaps in the extant literature and suggest directions for future research.

Keywords: Mergers & Acquisitions, Post-merger integration, IS integration, Literature review, Scientometric analysis

1 Introduction

Over the last decade, mergers and acquisitions (M&As) have increased, with over 40.000 globally in 2013 (Thomson Reuters, 2014). Stimulated by this activity, M&As have become a focus of research in several academic fields. Typically, these studies find that M&As present great opportunities for some companies to expand their businesses. However, a number of factors substantially limit these opportunities. In practice, 60-70% of acquisitions in the private sector destroy rather than create financial value as measured by short-term performance, long-term performance, and firm value (See, for example, Datta et al., 1992; King et al., 2004).

Haleblian et al. (2009) survey M&A research in the accounting, economics, finance, management and sociology literatures from 1992 to 2007. They identify 864 articles researching the challenges to successful M&As and how to overcome those challenges. This research shows that M&As are multifaceted phenomena for which no single approach gives a full account. Financial, strategic, managerial, sociological, organizational and psychological research contribute various insights into and offer normative recommendations for managing M&As.

Despite the extant research, explanations for successful M&As remain incomplete (Haleblian et al., 2009). In addition, as business practices and global conditions for business evolve, so do the foundations for value creation in M&As. Consequently, the explanation of how value is created becomes a search for a moving target (Henningsson & Carlsson, 2011). Explanatory models must be revised continuously in response to the evolving business conditions on which successful M&As are contingent.

One critical aspect of this evolving domain is that businesses have become pervasively dependent on their information systems (IS). These now play a critical role in the realization of value from M&As. Sarrazin and West (2011) estimate that 45-60% of the expected benefits from M&As are directly dependent on post-acquisition IT integration. In addition, a survey by Accenture identifies IT integration as the second most important reason for M&A failures (Accenture, 2006).

In response, research on the role of IS in M&As has increased. In the literature search described below, we identify 47 articles on this issue. Collectively, this research have contributed a range of important insights about IS issues in M&As. However, the research has significant gaps in the extant knowledge base and evolves in a non-cumulative mode (Wijnhoven et al., 2006; Mehta & Hirschheim, 2007; Henningsson & Carlsson, 2011). Therefore, to enable the research field to take stock of existing research and to inform future research, this paper reviews the *object of study*, *research approach* taken and *theoretical developments* made in the extant literature on IS in M&As.

The motivation for this analytical focus of our review is that the choice of the object of study and the research approach have important implications for the theories that can be developed and the conclusions that can be drawn (Venkatesh et al., 2012). Consistent with this, the review shows that research has favoured some types of study objects and research approaches over others, limiting theoretical developments.

Typically, extant research has focused on individual acquisitions or mergers of single-business units driven by economies of scale and scope. These have been studied in the context of manufacturing and financial industries, based on theoretical frameworks from the strategic management and organizational disciplines, with a mix of case study and survey methodologies. Within this narrow selection of research objects and research approaches, researchers have developed analytical and explanatory theory addressing the IS integration challenges and capabilities associated with ensuring merger or acquisition performance.

To advance the research field, we call for two research programs. The first should focus on *managing the known*. That is, for the IS issues we have identified and for which we have initial explanations, research should focus on developing theories for prediction and action. Second, we call for a research program on *exploration of the unknown*. We should broaden the scope of objects studied and research approaches taken

beyond the currently narrow frame. For example, we should research the performance of growth-by-acquisition programs rather than single acquisitions only and adopt quantitative analytical frameworks to analyse performance data to complement the research approaches in the extant research.

The remainder of this paper is divided into seven sections. We begin by describing our methodology and the sample of studies included in the review. The findings are then presented in three sections. The first defines the objects studied. The second examines the research approaches employed. The third presents the theoretical development made. Then, drawing on this analysis, we discuss the resultant research gaps and outline directions for future research. Finally, we highlight our conclusions.

2 Methodology

The literature review is conducted in two steps. First, we define the scope and identify articles fitting within it. Second, we conduct a review of the research objectives, approach and contributions.

2.1 Scope definition and article selection

Following Pateli and Giaglis (2004), we define the scope of our search along three dimensions: outcomes, relevant time span, and search terms used. We perform three separate searches: initial search, backwards search by investigating the reference lists of the selected articles, and forward search by investigating articles that cite the selected articles (Webster & Watson, 2002; Yang & Tate, 2012).

To do this, we adopt a database-driven approach (Webster & Watson, 2002; Brocke et al., 2009) using a list of research material from academic journals and conference proceedings. Specifically, to be considered for inclusion, a paper must have been published in one of the following publications:

- Journals listed by the AIS Journal Citation list, which contains 86 journals from different academic fields, including IS, strategic management and organization.
- Journals with impact factor above 1.0 in Thomson Reuter's Web of Science, covering more than 2,500 quality-controlled academic journals.
- The proceedings of the AIS international and regional conferences (ICIS, AMCIS, ECIS, PACIS).

The initial full-text search covers peer-reviewed content in Business Source Complete (1989-2014), ScienceDirect (1989-2014) and the AIS Electronic Library (AISeL) (1989-2014). To develop the set of relevant search terms for our review, we initially adopted the terms: *Integration, Acquisition* and *Information*. From the initial sample identified, we extracted the following additional terms: *Merger, Serial, Post-Merger* and *Planning, Information Systems* (IS), and *Information Technology* (IT). The full list is:

[((acquisition) OR (integration) OR (post-merger) OR (acquisition AND integration) OR (post AND merger AND integration) OR (serial AND acquisition) OR (integration AND planning)) AND (Information Systems OR Information Technology OR IS integration OR IT integration)]

Collectively, the searches of the three databases identify 638 publications for inclusion potential in the review. Inspecting the titles and abstracts of these publications, 480 publications were judged not to be relevant to the topic. For example, they include publications researching the acquisition and integration of new IT systems, rather than of companies. Another 116 publications were rejected after a full review of the paper. These include topics judged to be tangential to our focus on M&A-integration. They report very limited information on M&A integration, are non-theoretical reviews or methodological papers, and/or significantly overlap with a subsequent paper by the same author, including, for example, a conference paper that was later published in an extended form as a journal paper.

The database-driven search was limited in that several journals and conferences were not indexed during the full time span of our search. For example, the AISeL library index AMCIS only since 1997 and the Information Systems Journal is included in the Business Source Complete database only from 1998. To compensate for this limitation, we conducted backward and forward searches for additional articles (Webster & Watson, 2002). In a backward search, we reviewed the reference lists of our sample of articles to identify relevant articles not captured by our database driven search. For a forward search, we used Thomson Reuters' Web of Science and Google Scholar to review the articles that referenced the articles already in our sample. These searches identified five additional articles. A set of 47 articles, published in 14 journals and four conference proceedings, were selected for this review (See Appendix A).

2.2 Scientometric analysis

Leyesdorff (2001, p.i) defines scientometrics as "the quantitative study of scientific communication" and Lowry et al. (2004, p. 30) define it as "the scientific study of the process of science". Lewis et al. (2007) recommend the methodology to advance the on-going evaluation and improvement of an academic discipline. Scientometric studies have been conducted on a broad range of topics in IS research, including IS as a reference discipline and the epistemological structure of the IS field (Kroenung & Eckhardt, 2012; Grover et al., 2006).

Analysis of the 47 articles was partitioned into three sub-tasks: data coding, data display and drawing conclusions (Miles & Huberman, 1994). Drawing on Strauss and Corbin (1990), a technique similar to systematic categorization was employed to code the articles. The coding categories are presented in Table 1. With the exception of *industry* and *theoretical development aspiration*, the values for each category

were created inductively. To develop inductively generated coding categories, we used the process of constant comparison (Strauss & Corbin, 1990). In this process, the researcher looks for similarities and differences in categories, until no significantly new categories emerge[1]. These codes were then clustered into higher-level, more general themes.

For industry, we relied on the North American Industry Classification System (NAICS) of the United States Census Bureau. NAICS is the successor of the Standard Industry Classification (SIC) System. To code industry, we adopt the top-level classification from NAICS, which distinguishes 20 industry sectors. Pre-defined values for theoretical development aspiration are derived from Gregor (2006).

Table 1. Scientometric coding categories

	Coding category	**Value**
Object of study	Transaction	M&A in general, Merger, Acquisition, Acquisition program
	Chief actor	Merging partner, Acquirer, Acquisition target, Vendor
	Industry	Automotive, Banking, Media/Publishing, Real Estate/Construction, Healthcare, High-Tech, Industrial, Manufacturing, Telecommunications, Transport, Non-Specific
Research approach	Empirical data	Single case, Multiple case, Survey, Empirical, Conceptual
	Theoretical frameworks	Alignment, Business Process, Corporate Strategy, Diversification, IT Governance, Knowledge Management, Organizational Culture/Learning, Resource-Based View, Strategic IS Planning, Grounded/Other/None
Contribution	Nature of theory development	Theory for analysis, explanation, prediction, explanation and prediction, and design and action
	Research focus	IS integration challenges, IS integration capabilities

To ensure the objectivity and the reliability of the coding process, we developed a codebook, which includes proof-texts for each value of the categories in Table 1. The content analysis was performed by two researchers (Krippendorff, 2004). Inter-rater reliability is 93% (c.f. Holsti, 1969). Disagreements were resolved through discussion.

[1] The full list of coding categories is available from the corresponding author upon request.

3 Publication date and citations

The frequency distribution of papers by year is graphed in Figure 1. Thirty-nine of the papers (83%) were published between 2004 and 2014. Figure 1 shows that papers can be partitiond into two distinct generations: The first before 2000 and the second after 2004. In the sample of journals and conferences that were searched, no papers on IS integration in M&As are published between 2000 and 2003.

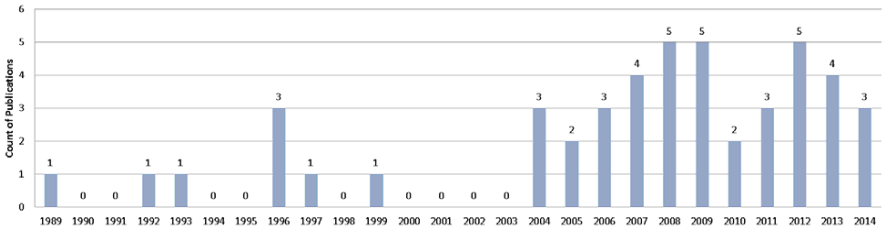

Figure 1. Frequency distribution of articles by year

Table 2 reports where the 47 papers were published. Only two journals have published more than two of these papers: Information & Management and Journal of Strategic Information Systems. Information & Management was the preferred journal for publication before 2000. After 2000, the Journal of Strategic Information Systems has been the preferred outlet. Of the 47 papers in the sample, 24 were published in journals and 23 in conference proceedings. Ten of the papers were published in the AIS Senior Scholars' Basket of Eight Journals, with eight published since 2004, suggesting a growing interest in the area by researchers. Notably, only one paper was published in a journal not primairly associated with the IS dicipline. This indicates that the topic of IS in M&As is a topic that has attracted attention only from the IS dicipline and not from general strategy or organizational researchers.

As expected, the first generation of papers has higher citations than the more recent papers. The most cited paper is by Weber and Pliskin (1996). However, this paper is typically cited outside the domain of IS integration in M&A. The paper investigates the impact of both IS integration and organizational culture factors on post-merger integration. The findings about culture have received most citations. The papers that have shaped the area of inquiry are Giacamazzi et al. (1997), Robbins and Stylianou (1999), Stylianou et al., (1996), and Johnston and Yetton (1996). We discuss below how these papers influenced subsequent research in the section on integrative analysis of theoretical contribution.

Table 2. Distribution by journal/conference

Journal	**Articles**
European Journal of Information Systems (2 papers)	Henningsson 2014, Tanriverdi & Uysal 2013
European Management Journal (1 paper)	Garcia-Canal et al. 2013
Industrial Management & Data Systems (1 paper)	Chang et al. 2014
Information & Management (6 papers)	Buck-Lew et al. 1992, Giacomazzi et al. 1997, Rheaume & Bhabra 2008, Robbins & Stylianou 1999, Stylianou et al. 1996, Weber & Pliskin 1996
Information Systems Frontiers (1 paper)	Alaranta & Henningsson 2008
Information Systems Journal (1 paper)	Henningsson & Carlsson 2011
Information Systems Research (1 paper)	Tanriverdi & Uysal 2011
International Journal of Information Management (1 paper)	Vieru & Rivard 2014
Journal of Association for Information Systems (1 paper)	Mehta & Hirschheim 2007
Journal of Global Information Management (1 paper)	Chin et al. 2004
Journal of Strategic Information Systems (4 papers)	Baker & Niederman 2013, Johnston & Yetton 1996, Merali & McKiernan 1993, Wijnhoven et al. 2006
Long Range Planning (1 paper)	Parada et al. 2009
Management Information Systems Quarterly (1 paper)	Main & Short 1989
Management Information Systems Quarterly Ex. (2 papers)	LeFave et al. 2008, Yetton et al. 2013
Conference	
Americas Conference on Information Systems (6 papers)	Hwang 2004, Lin & Shang 2012, Morsell et al. 2009, Murphy & Platt 2009, Schonewille 2010, Vieru & Rivard 2007
European Conference on Information Systems (6 papers)	Alaranta & Viljanen 2004, Alaranta 2005, Brunetto 2006, Eckert et al. 2012, Henningsson & Carlsson 2006, Miklitz & Buxmann 2007
International Conference on Information Systems (7 papers)	Alaranta & Martela 2012, Benitez-Amado et al. 2012, Bohm et al. 2011, Gregory et al. 2012, Henningsson & Yetton 2011, Kathuria et al. 2008, Neiderman & Baker 2009
Pacific-Asia Conference on Information Systems (4 papers)	Holm-Larsen 2005, Lin & Chao 2008, Myers 2008, Seddon et al. 2010

Within the more recent group of publications, the paper by Wijnhoven et al. (2006) has more than 100 citations and the most citations per year since publication (See Table 3)[2]. In the group of papers published

[2] Citations at 9 October, 2014 as reported by Google Scholar.

since 2004, the number of citations is highly correlated with the journals in which the papers are published. The three first papers on the list are all published in the AIS Senior Scholar's Basket of Journals. This probably reflects both the quality of the papers and the status of the journals.

Table 3. Citations

	Papers published before 2000		Papers published from 2004	
Rank	**Paper**	**Citations**	**Paper**	**Citations**
1	Weber & Pliskin 1996	167	Wijnhoven et al. 2006	102
2	Giacomazzi et al. 1997	112	Mehta & Hirschheim 2007	61
3	Robbins & Stylianou 1999	105	Tanriverdi & Uysal 2011	33
4	Stylianou et al. 1996	105	Alaranta & Henningsson 2007	23
5	Johnston & Yetton 1996	83	Chin et al. 2004	26
6	Main & Short 1989	41	Henningsson & Carlsson 2011	21
7	Merali & McKiernan 1993	41	Rheaume & Bhabra 2008	17
8	Buck-Lew et al. 1992	37	Hwang 2004	19

Interestingly, for most researchers that publish papers on IS integration in M&As, the topic is not their primary research stream. Only 12 authors have published more than one paper on the topic, in the sample reviewed here. Of those 12, only three researchers have published more than two papers: Henningsson has authored seven papers, and Alaranta and Yetton have each authored four.

4 Object of study

The *object of study* is defined by three clusters of codes. The first defines the transaction object: *M&A in general, merger, individual acquisition, acquisition program*. The second defines the *chief actor*: *Merging partner, acquirer, acquisition target*. The third is the industry context: *Finance and insurance, health care and social assistance, professional, scientific and technical services, utilities, manufacturing, transportation and warehousing, information, real estate and rental, and non-specific.*

4.1 Transaction

Table 4 reports the frequency with which each of the four distinct categories of transaction is examined in the sample of 47 papers. The general M&A category does not make any explicit or implicit distinction between 'mergers' and 'acquisitions' in problem definition or analysis. This is based on the argument that the distinction between 'mergers' and 'acquisitions' is only juridical (e.g. Mehta & Hirschheim, 2004; Wijnhoven et al., 2006). What appears to be an acquisition may, in a legal sense, be a merger. Similarly, what appears to be a neutral merger might, in a legal sense, be an acquisition (Giacomazzi et al., 1997).

Table 4. Transaction

Transaction	Papers
M&A in general (16 papers)	Baker & Niederman 2013, Brunetto 2006, Chang et al. 2014, Holm-Larsen 2005, Hwang 2004, Lin & Shang 2012, Miklitz & Buxmann 2007, Morsell et al. 2009, Myers 2008, Neiderman & Baker 2009, Robbins & Stylianou 1999, Schonewille 2010, Seddon et al. 2010, Stylianou et al. 1996, Tanriverdi & Uysal 2011, Vieru & Rivard 2007,
Merger (10 papers)	Alaranta 2005, Alaranta & Martela 2012, Alaranta & Viljanen 2004, Gregory et al. 2012, Johnston & Yetton 1996, LeFave et al. 2008, Lin & Chao 2008, Main & Short 1989, Murphy & Platt 2009, Vieru & Rivard 2014
Individual acquisition (17 papers)	Alaranta & Henningsson 2008, Benitez-Amado et al. 2012, Bohm et al. 2011, Buck-Lew et al. 1992, Eckert et al. 2012, Garcia-Canal et al. 2013, Giacomazzi et al. 1997, Henningsson & Carlsson 2006, Henningsson & Carlsson 2011, Kathuria et al. 2008, Mehta & Hirschheim 2007, Merali & McKiernan 1993, Rheaume & Bhabra 2008, Tanriverdi & Uysal 2013, Weber & Pliskin 1996, Wijnhoven et al. 2006, Yetton et al. 2013
Acquisition program (4 papers)	Chin et al. 2004, Henningsson & Yetton 2011, Henningsson 2014, Parada et al. 2009

However, there is a growing recognition that the various transactions studied in the literature are different. From an IS perspective, the many acquisitions undertaken by organizations, such as Siemens or Cisco, are fundamentally different integration projects compared with the merger of two multi-business organizations (Henningsson & Yetton, 2011). Similarly, there is a difference between the integration of individual acquisitions and of acquisitions that form part of a growth-by-acquisition program (Yetton et al., 2013). For example, the latter raises the issue of learning across multiple acquisitions (e.g. Henningsson 2014). Table 4 reports that there are only four papers in the data set researching serial acquirers. In contrast, there are 18 papers investigating individual acquisitions.

Transactions also differ in the benefits targeted. Four types of benefits are identified: economies of scale, economies of scope, innovative capability acquisition and business transformation (See, for example, Chin et al., 2004; Wijnhoven et al, 2006; Baker & Niederman, 2013). These are matched with different IT integration mechanisms. From an IT perspective, these are fundamentally different transactions. The M&As papers listed in Table 4 are motivated in the main by economies of scale and scope. The list includes a few examples of M&As involving business transformations (e.g. the Kléber acquisition in Henningsson & Carlsson, 2011). None of the papers addresses the use of M&As to access innovative capabilities.

4.2 Chief actor

In the IS literature, M&As have been analysed from the perspective of three different stakeholders: *the*

merging partner, the acquirer and *the acquisition target* (Table 5). The third perspective is not the primary focus of any of the papers reviewed here. Instead, researchers have addressed it as part of a combined view on the acquirer and the target (e.g. Mehta & Hirschheim, 2007).

Table 5: Actors

Actor	**Papers**
Merging partner (24 papers)	Alaranta 2005, Alaranta & Viljanen 2004, Baker & Niederman 2013, Brunetto 2006, Chang et al. 2014, Henningsson & Carlsson 2011, Holm-Larsen 2005, Hwang 2004, Johnston & Yetton 1996, LeFave et al. 2008, Lin & Chao 2008, Lin & Shang 2012, Main & Short 1989, Miklitz & Buxmann 2007, Murphy & Platt 2009, Myers 2008, Neiderman & Baker 2009, Robbins & Stylianou 1999, Schonewille 2010, Seddon et al. 2010, Stylianou et al. 1996, Tanriverdi & Uysal 2011, Tanriverdi & Uysal 2013, Vieru & Rivard 2007
Combined perspective (2 papers)	Bohm et al. 2011, Mehta & Hirschheim 2007
Acquirer (21 papers)	Alaranta & Henningsson 2008, Alaranta & Martela 2012, Benitez-Amado et al. 2012, Buck-Lew et al. 1992, Chin et al. 2004, Eckert et al. 2012, Garcia-Canal et al. 2013, Giacomazzi et al. 1997, Gregory et al. 2012, Henningsson & Carlsson 2006, Henningsson & Yetton 2011, Henningsson 2014, Kathuria et al. 2008, Merali & McKiernan 1993, Morsell et al. 2009, Parada et al. 2009, Rheaume & Bhabra 2008, Vieru & Rivard 2014, Weber & Pliskin 1996, Wijnhoven et al. 2006, Yetton et al. 2013

The merging partner is one of the organizations in a combination of equals that becomes part of a political process to design and implement post-merger IS integration. The acquirer is the more powerful, usually larger, organization that dictates the conditions for the IS integration. The acquisition target is the organization being acquired, which confronts the risk of staff and skill redundancies.

There are 21 papers in which the chief actor is the acquirer and 24 papers in which the chief actor is the merging partner. These two perspectives comprise 96% of the total papers reviewed. The combined perspective of the parties in the transaction is the chief actor in only two of the 47 articles. These two papers report that post-acquisition performance is a function of a mix of collaboration and competition.

Among the actors analysed, the large majority are analysed as single business organizations (SBOs). Studies addressing transactions by or of multi-business organizations (MBO) are few. Eleven papers address transactions involving MBOs. However, these papers typically treat the MBO analytically as an SBO with one single business and IT strategy (e.g. Chin et al., 2004; Holm-Larsen, 2005; Seddon et al., 2010). Transactions involving MBOs are supposed to lead to increased complexity as business and IT strategies are formed at both corporate and business unit level.

4.3 Industry

The industry context has major effects on theory development (Chiasson & Davidson, 2006). Inspecting Table 6, 22 papers do not specify the industry context. This is typical of management research, which implicitly, if not explicitly, assumes that the findings are general, holding for all industries. This is in contrast to practice, where the partners in major consulting firms have both a functional expertise, for example, strategy, HR and marketing, and an industry expertise, for example, banking, health, mining, and oil and gas. A partner with an IT and mining profile would not lead IT project for a bank.

Table 6: Industry

Industry	**Papers**
Finance and Insurance (8 papers)	Buck-Lew et al. 1992, Holm-Larsen 2005, Johnston & Yetton 1996, Lin & Chao 2008, Murphy & Platt 2009, Seddon et al. 2010, Gregory et al. 2012, Parada et al. 2009
Health Care and Social Assistance (3 papers)	Main & Short 1989, Vieru & Rivard 2014, Wijnhoven et al. 2006
Professional, Scientific, and Technical Services (High-Tech) (2 papers)	Alaranta & Martela 2012, Chang et al. 2014
Utilities (2 papers)	Giacomazzi et al. 1997, LeFave et al. 2008
Manufacturing (7 papers)	Alaranta 2005, Henningsson & Carlsson 2006, Henningsson & Carlsson 2011, Henningsson & Yetton 2011, Henningsson 2014, Yetton et al. 2013, Garcia-Canal et al. 2013
Transportation and Warehousing (1 paper)	Schonewille 2010
Information (1 paper)	Rheaume & Bhabra 2008
Real Estate and Rental and Leasing (1 paper)	Brunetto 2006
Non-specific (22 papers)	Alaranta & Henningsson 2008, Alaranta & Viljanen 2004, Baker & Niederman 2013, Benitez-Amado et al. 2012, Bohm et al. 2011, Chin et al. 2004, Eckert et al. 2012, Hwang 2004, Kathuria et al. 2008, Lin & Shang 2012, Mehta & Hirschheim 2007, Merali & McKiernan 1993, Miklitz & Buxmann 2007, Morsell et al. 2009, Myers 2008, Neiderman & Baker 2009, Robbins & Stylianou 1999, Stylianou et al. 1996, Tanriverdi & Uysal 2011, Tanriverdi & Uysal 2013, Vieru & Rivard 2007, Weber & Pliskin 1996

Table 6 shows that Finance and Insurance (8 papers) and Manufacturing (7 papers) are the industries most frequently studied. We speculate that this occurs for two reasons. One is that many of the existing models of strategic and organizational aspects of M&A were developed based on the manufacturing industries and

the related synergistic effects of scale and scope. So, using the Manufacturing industry for theory building reduced the uncertainty and enabled the positioning of IS research in the extant M&A literature.

The other reason is that, by the mid-1990s, the Financial and Insurance industries were already highly dependent on IT. So, M&As in that industry were already critically contingent on post-acquisition IT integration (See, for example, Johnston and Yetton 1996). Hence, the Finance and Insurance industry highlights the effects of IS integration in the complex post-acquisition IT and organizational integration processes (Sarrazin & West, 2011; Wolfert et al., 2010). Therefore, this industry has been a preferred context for IT theory development. However, both possible reasons raise questions about the generalizability of the findings.

Conspicuous by its absence in Table 6, is research on 'hi-tech' industries. This is a sub-category of the Professional, Scientific, and Technical Services category. For many of these companies, including Google, Siemens and Cisco, acquisitions are integrated parts of their corporate strategies. For example, between 1996 and 2013, Cisco made more than 170 acquisitions[3]. Future research in this industry would allow a focus on two under-researched areas. One is the behaviour of serial acquirers. The other is the effect on performance of post-acquisition IT integration in industries that are IT platform-centric, rather than SBU-focused, as the basis of their competitive advantage.

5 Research approach

Two clusters of codes define the *research approach* adopted in each paper. One is the *data collection* cluster. These codes differentiate between the collection of qualitative and quantitative data. The other is the *theoretical framework* cluster. These codes refer to the theoretical basis used to frame the study presented in the paper.

5.1 Research method

In the general literature on M&As, studies based on quantitative data (surveys and empirical studies) outnumber the studies based on qualitative data (single and multiple case studies) by a factor of 20 to one (Bengtsson & Larsson, 2012). In contrast, in the extant literature on post-acquisition IS integration, only 12 of 47 papers are based on survey or empirical data (See Table 7).

[3] http://en.wikipedia.org/wiki/List_of_acquisitions_by_Cisco_Systems

Table 7. Research Methodology

Data Collection	Papers
Single case (19 papers)	Alaranta 2005, Alaranta & Henningsson 2008, Alaranta & Martela 2012, Baker & Niederman 2013, Henningsson 2014, Holm-Larsen 2005, Main & Short 1989, Vieru & Rivard 2014, Buck-Lew et al. 1992, Bohm et al. 2011, Chang et al. 2014, Chin et al. 2004, Gregory et al. 2012, Henningsson & Carlsson 2006, Johnston & Yetton 1996, LeFave et al. 2008, Lin & Chao 2008, Parada et al. 2009, Yetton et al. 2013
Multiple case (8 papers)	Brunetto 2006, Garcia-Canal et al. 2013, Henningsson & Carlsson 2011, Henningsson & Yetton 2011, Mehta & Hirschheim 2007, Schonewille 2010, Seddon et al. 2010, Wijnhoven et al. 2006
Survey (11 papers)	Merali & McKiernan 1993, Stylianou et al. 1996, Weber & Pliskin 1996, Giacomazzi et al. 1997, Robbins & Stylianou 1999, Morsell et al. 2009, Murphy & Platt 2009, Neiderman & Baker 2009, Tanriverdi & Uysal 2011, Tanriverdi & Uysal 2013, Benitez-Amado et al. 2012
Empirical (1 paper)	Rheaume & Bhabra 2008,
Experiment (1 paper)	Kathuria et al. 2008
Expert interview (2 papers)	Eckert et al. 2012, Myers 2008
Conceptual (5 papers)	Alaranta & Viljanen 2004, Hwang 2004, Miklitz & Buxmann 2007, Vieru & Rivard 2007, Lin & Shang 2012

We speculate that the explanation for the different distributions of data collection methodologies is two-fold. One, there are many public and commercial databases available, covering various dimensions of M&A behaviour to support quantitative analysis. However, these databases do not cover IS dimensions of M&A behaviour. This makes quantitative compared with qualitative studies of post-acquisition IS integration in M&As comparatively more difficult to carry out.

The other explanation is that it is difficult to negotiate access for in-depth studies of the strategic and political aspects of M&As. For example, the pricing, financing and other decisions taken during the due diligence process are highly sensitive market data that is subject to strict regulatory controls. In contrast, the IS integration challenges are perceived to be less sensitive, not deal breakers, and are not subject to strict regulatory controls. This makes qualitative research on M&As in general more difficult to carry out compared with qualitative research on post-acquisition IS integration. In combination, these two explanations strongly favour studies of post-acquisition IT integration to be based on qualitative rather than quantitative data.

5.2 Theoretical frameworks

In the extant literature on M&As, studies have been based largely on strategic management and

organizational theories. Specifically, four mainstream theoretical frameworks, Alignment theory (8 papers), Organizational Culture/Learning (6 papers), Resource-Based View (12 papers) and Strategic IS Planning (8 papers), have been applied in 34 of 47 papers (See Table 8).

Table 8. Theoretical frameworks

Theoretical frameworks	**Papers**
Alignment theory (8 papers)	Baker & Niederman 2013, Bohm et al. 2011, Brunetto 2006, Buck-Lew et al. 1992, Henningsson & Yetton, 2011, Johnston & Yetton 1996, Mehta & Hirschheim 2007, Wijnhoven et al. 2006
Business Process (2 papers)	Holm-Larsen 2005, Parada et al. 2009
Corporate Strategy (4 papers)	Giacomazzi et al. 1997, Henningsson & Carlsson 2006, Lin & Shang 2012, Merali & McKiernan 1993
Diversification Theory (1 paper)	Rheaume & Bhabra 2008
Grounded/Other/None (3 papers)	Neiderman & Baker 2009, Garcia-Canal et al. 2013, Seddon et al. 2010
IT Governance (1 paper)	Chin et al. 2004
Knowledge Management (2 papers)	Alaranta & Martela 2012, Vieru & Rivard 2007
Organizational Culture/Learning (6 papers)	Alaranta & Viljanen 2004, Henningsson 2014, Kathuria et al. 2008, Lin & Chao 2008, Vieru & Rivard 2014, Weber & Pliskin 1996
Resource-Based View (12 papers)	Alaranta 2005, Benitez-Amado et al. 2012, Chang et al. 2014, Henningsson & Carlsson 2011, Hwang 2004, LeFave et al. 2008, Miklitz & Buxmann 2007, Murphy & Platt 2009, Myers 2008, Tanriverdi & Uysal 2011, Tanriverdi & Uysal 2013, Yetton et al. 2013
Strategic IS Planning (8 papers)	Alaranta & Henningsson 2008, Eckert et al. 2012, Gregory et al. 2012, Main & Short 1989, Morsell et al. 2009, Robbins & Stylianou 1999, Schonewille 2010, Stylianou et al. 1996

Given the relative novelty of the area, surprisingly few papers have adopted grounded methods to induce theoretical models. Instead, the common strategy has been to extend the use of theoretical frameworks that have proven useful in the investigation of related subjects. Absent from the list in Table 8 are examples of some of the most commonly used theories in IS research, including adoption theory, portfolio theory and various forms of innovation theory. We speculate that the threads of research in this field have been primarily based on the seminal work of a few researchers and cumulative building of explanations to the issues identified in early research on IS in M&As. As new research directions emerge, the use of new theoretical lenses will be necessary.

6 Theoretical development

Two clusters of codes describe the theoretical development in the investigated papers. The first is the *nature of theory development* cluster. These codes determine which of Gregor's (2006) five categories of theory development is the primary intent of each paper. The second is the *research focus* cluster. These codes denote the primary area of theory development.

6.1 Nature of theoretical development

Gregor's (2006) taxonomy of theories differentiates between five types of theories: Theory for analysing, theory for explaining, theory for predicting, theory for explaining and predicting, and theory for design and action. Table 9 reports that eight papers developed a theory for analysing, 24 a theory of explanation, three a theory for prediction, six a theory for explanation and prediction, and six a theory for design and action.

Table 9. Nature of theoretical development

Nature of theoretical development	**Papers**
Analysing (8 papers)	Baker & Niederman 2013, Chin et al. 2004, Hwang 2004, Lin & Shang 2012, Myers 2008, Tanriverdi & Uysal 2013, Vieru & Rivard 2007, Wijnhoven et al. 2006
Explaining (24 papers)	Alaranta 2005, Alaranta & Martela 2012, Alaranta & Viljanen 2004, Buck-Lew et al. 1992, Garcia-Canal et al. 2013, Gregory et al. 2012, Henningsson 2014, Henningsson & Carlsson 2011, Johnston & Yetton 1996, LeFave et al. 2008, Lin & Chao 2008, Main & Short 1989, Mehta & Hirschheim 2007, Merali & McKiernan 1993, Morsell et al. 2009, Murphy & Platt 2009, Neiderman & Baker 2009, Parada et al. 2009, Rheaume & Bhabra 2008, Schonewille 2010, Seddon et al. 2010, Tanriverdi & Uysal 2011, Vieru & Rivard 2014, Yetton et al. 2013
Predicting (3 papers)	Brunetto 2006, Henningsson & Yetton 2011, Robbins & Stylianou 1999
Explaining & Predicting (6 papers)	Benitez-Amado et al. 2012, Bohm et al. 2011, Chang et al. 2014, Holm-Larsen 2005, Kathuria et al. 2008, Weber & Pliskin 1996
Design & Action (6 papers)	Alaranta & Henningsson 2008, Eckert et al. 2012, Giacomazzi et al. 1997, Henningsson & Carlsson 2006, Miklitz & Buxmann 2007, Stylianou et al. 1996

This emphasis on theories for explanation may be transitory, a function of the limited research on the topic. Consistent with this explanation, the argument is frequently made that the field is sparsely investigated and that initial, exploratory theoretical development is needed. However, with 47 published papers, there is a theoretical body of knowledge on which to build, and there is less need for more exploratory studies. Instead, there is the challenge to build theories for prediction, and for design and action.

6.2 Research focus

Table 10 presents the research focus of the papers investigated. The extant research can be partitioned into two broad research streams. The first stream addresses the IS integration challenges in M&As. These are papers where the primary theoretical contribution is to explain the effects of IS integration strategy on M&A performance. The second stream addresses IS integration capabilities, where the primary theoretical contribution is to explain the effects of acquisition capabilities on post-acquisition IT integration. The IS integration challenge was the initial focus of the early, exploratory research. Later research has increasingly focused on IS integration capabilities and their antecedents to explain post-acquisition IS integration.

Table 10. Research focus

Research focus	**Papers**
IS integration challenge (21 papers)	Alaranta & Viljanen 2004, Alaranta 2005, Baker & Niederman 2013, Giacomazzi et al. 1997, Henningsson & Carlsson 2006, Hwang 2004, Kathuria et al. 2008, Lin & Chao 2008, Lin & Shang 2012, Mehta & Hirschheim 2007, Merali & McKiernan 1993, Miklitz & Buxmann 2007, Murphy & Platt 2009, Myers 2008, Neiderman & Baker 2009, Rheaume & Bhabra 2008, Schonewille 2010, Stylianou et al. 1996, Tanriverdi & Uysal 2013, Vieru & Rivard 2007, Weber & Pliskin 1996.
IS integration capabilities (26 papers)	Alaranta & Henningsson 2007, Alaranta & Martela 2012, Benitez-Amado et al. 2012, Bohm et al. 2011, Brunetto 2006, Buck-Lew et al. 1992, Chang et al. 2014, Chin et al. 2004, Eckert et al. 2012, Garcia-Canal et al. 2013, Gregory et al. 2012, Henningsson 2014, Henningsson & Carlsson 2011, Henningsson & Yetton 2011, Holm-Larsen 2005, Johnston & Yetton 1996, LeFave et al. 2008, Main & Short 1989, Morsell et al. 2009, Parada et al. 2009, Robbins & Stylianou 1999, Seddon et al. 2010, Tanriverdi & Uysal 2011, Vieru & Rivard 2014, Wijnhoven et al. 2006, Yetton et al. 2013.

Research on IS integration in M&As began in the late 1980's and early 1990's. This research appears to be a response to the fourth worldwide M&A wave in the late 1980's, combined with the increasing importance of IT in business. Five pioneering articles (Giacomazzi et al., 1997; Weber & Pliskin, 1996; Robbins & Stylianou, 1999; Stylianou et al., 1996; Johnston & Yetton, 1996) put forward the key argument that business benefits from acquisitions are contingent on IS integration. In this early research, a key objective was simply to identify the factors and processes that contributed to the performance of IT integration. These articles do not references each other. They are explorative, describing an empirical phenomenon of growing importance.

Subsequently, having outlined the principle role of IS integration to be enabling business benefits contingent on IS integration, research in the stream of IS integration challenge focuses on explaining how

different strategies impact the realization of acquisition benefits (See, for example, Johnston & Yetton, 1996; Giacomazzi et al., 1997). The findings suggest that different IT integration strategies involve very different challenges.

The research stream on how acquirers cope with the IT integration challenge and why some acquirers are more successful than others, has focused on defining the IT integration capabilities and the antecedents to those capabilities. Two IT integration capabilities dominate this research stream: the diagnosis capability and the implementation capability. The diagnosis capability refers to the acquirer's or merging partner's ability to select the appropriate mix of IT integration strategies to realize IT-based acquisition benefits (Ko et al., 2009; Merali & McKiernan, 1993). The implementation capability refers to the acquirer's or merging partner's capability to enact the mix of strategies selected (Wijnhoven et al., 2006).

Researchers have also started to ask questions concerning the antecedents of the variance in acquirers' and merging partners' IT integration capabilities. They argue that acting proactively in M&As is more about setting up the company to be able to act in the event of an acquisition or merger, than actively combining companies that fit in terms of the IS they possess. Following this line of argument, research has highlighted the potential for improving the technical capacity for M&As by increasing IT flexibility and, specifically, by increasing modularization (Henningsson et al., 2007).

Tanriverdi and Uysal (2011) investigate acquirers' cross-business IT integration capability and find that it is correlated with the financial value that acquirers extract from their acquisitions. The cross-business IT integration capability is a general capability to integrate IS across organizational departments rather than an acquisition-specific capability. Hence, the results of the Tanriverdi and Uysa (2011) study indicate that there is a correlation between how good an acquirer is at IS integration in general and at IS integration specifically in M&As. Henningsson (2014) comments directly on this issue concluding that IT integration capabilities for M&As are not general IT capabilities and must be developed over a series of heterogeneous M&A experiences.

7 Discussion

Recall from the Introduction section that the purpose of this review is to identify how to build on the extant literature. To do this, we look backward to see where we are and we look forward to see where we should go next. Under each of the seven headings investigated, for example, 'Transaction' and 'Actor', we identify 'What has been done' and 'What should be done next'. The results of this investigation are summarized in Table 11.

Table 11. What has been done and what should be done next

	Looking backwards	**Looking forwards**
Object of study		
Transaction	• Single acquisition/ Individual acquirers • Single businesses • Scale/scope acquisitions	• Acquisition programs/Serial acquirers • Multi-businesses • Innovation acquisitions
Actor	• Acquirer/Merging partner • Single perspective	• Vendor, acquisition • Dual/multi-partner perspective
Industry	• Finance/banking • Manufacturing	• Hi-tech and high-velocity industries • Industries with platform-centric businesses
Research approach		
Method	• Case studies • Surveys	• Empirical studies • Design studies
Theoretical framework	• Alignment theory • Organizational Culture/Learning • The Resource-Based View • Strategic IS planning	• Critical investigation of the assumption of the used frameworks • Application of frameworks commonly used in the IS domain
Theoretical development		
Nature of theory development	• Analytical • Explanatory	• Predictive • Design and action
Research focus	• Acquisition performance • Challenges and capabilities	• Organizational performance • Antecedents to capabilities

7.1 Transaction

In the period investigated, we have seen increasing differentiation between the various types of M&As in the IS-based M&A literature. In the 1990s, "merger" and "acquisitions" were used interchangeably on the assumption that, from an IS perspective, there was no difference between the events. Now, however, we conclude that there are significant differences between both the challenges of and the solutions to building post-acquisition IS integration, when acquiring SMEs or business units from an MBO compared with a merger of two large companies. However, the theoretical distinction between acquisition and merger is a very crude distinction between transaction types and needs further refinement.

Extant research has focused on a narrow set of organizational transactions. The typical transaction studied in the extant literature is a single acquisition in which either a large firm acquirer a smaller business unit, or the merger of two single business firms to achieve economies. In both instances, the intent is to capture

the economies of scale or scope. This narrow scope of transactions studied is limited in three ways.

First, there is a lack of research on acquisition programs. Studies in the general management literature show that acquisitions are typically not isolated events, but instead form part of larger programs, for example, to enter a new market or to build a new product area. Compared with isolated acquisitions, acquisitions programs present additional challenges, including decisions on pace and scope of the acquisition program (Hayward, 2002); estimating synergies between targets and past, current and future acquisitions (Voss, 2007); and managing simultaneous integration projects (Barkema & Schijven, 2008). We speculate that these general challenges also hold for IS integration, including running multiple IS integration projects simultaneously. However, since the research on acquisition programs from an IT perspective is limited, we know little about the IT-challenges specific to acquisition programs.

With research focused on a single M&A rather than acquisition programs, individual acquirers rather than serial acquirers have been the subject of analysis. Given that 60% of all acquisitions are made by serial acquirers (Kengelbach et al., 2011), this is a major limitation. Compared with individual acquirers, serial acquirers are exposed to additional acquisition challenges (Keil et al., 2012). Frequently, serial acquirers must undertake comprehensive organizational restructuring after a few acquisitions (Barkema & Scheijven, 2008). This is because organizational inefficiencies in acquisition integration rapidly accumulate across a series of acquisition. From an IS perspective, the question is: What is the role of IT in this accumulation of inefficiency? We know that IS integration frequently is subject to severe time pressure (Mehta & Hirschheim, 2007, Johnston & Yetton, 1996). There is also strong evidence that IS integration frequently is solved suboptimally (e.g. Henningsson & Carlsson, 2011; Wijnhoven et al., 2006). However, we have no empirical studies or theoretical development to resolve IS integration challenges across a series of acquisitions and strategies for mitigating these effects.

Second, there is limited research on transactions motivated by benefits other than the economies of scale or scope. Increasingly, M&As are used to access technological innovations and innovation capabilities (Sears & Hoetker, 2014; Makri et al., 2010). These ‘technology acquisitions’ (Puranam et al., 2009; Ranft & Lord, 2002) are used to replace or complement internal innovation activities constrained by path dependency (Cyert & March, 1963; Kogut & Zander, 1992), time compression diseconomies (Dierickx & Cool, 1989) and “core rigidities” (Leonard-Barton, 1992). These technology acquisitions promise quick access to innovative technologies and capabilities. However, they are subject to problems of implementation and to high failure rates (Hagedoorn & Duysters, 2002; Steensma & Corley, 2000).

To understand and mitigate these challenges, the extant research has drawn extensively on strategic management, organizational and behavioural theories (Graebner et al., 2010). In this literature, the prefix

of ‘technology’ is frequently used when referring to acquisitions targeting innovations in digital-based industries (Sears & Hoetker, 2014; Makri et al., 2010). However, there is a general absence of technology-related considerations in the discourse on the management of technology acquisitions. We believe that there is much to learn about the challenges contingent on resource combination and integration in technology-based acquisitions from the extant research on technology-based competition within the IS discipline. In addition, understanding the opportunities and challenges associated with technology-based acquisition would provide a valuable point of departure to understand the competitive dynamics of digital industries.

7.2 Actor

Our review of how previous research has taken the perspective of the different actors in the M&A shows an emphasis on the perspective of one partner in a merger and the acquiring partner in an acquisition, with limited research on the perspective of the vendor and the acquired organization. The exception to the former is Bohm et al. (2011), which examines the acquisition of a business unit by an MBO from the perspective of the vendor. To the author’s knowledge, there is no study taking the perspective of the acquired organization. Future research should investigate the IS integration challenges from the vendor’s (the IT-carve out) and from the target’s perspectives. Yetton et al. (2013) ask what ‘ready to acquire’ means in terms of IS. Subsequent research should ask what ‘ready to be acquired’ implies for the target, and ‘ready to divest’ implies for the vendor.

In addition, research that analyses the counterparts in M&As as MBOs is scarce. Whereas, today, many large companies are structured as MBOs, with SBUs competing quasi-independently in different markets, in the extant literature these companies are analysed as homogenous organizations with one business and one IT strategy. While we assume that post-acquisition or post-merger alignment is a critical component in value creation for mergers among, and acquisitions of, MBOs, the challenges of these transactions are likely to be different. Logically, the acquisition of an MBO by another MBO would not simply be a challenge with more integration work streams run in parallel. A large merger would also include the critical question of how to integrate the pre-acquisition corporate IT platforms. Untangling the additional IT-related challenges posed by M&As among MBOs is an important topic for further research.

7.3 Industry

The extant research has largely investigated the role of IS integration in manufacturing and financial industries. These are attractive industries on which to start building an understanding of IS integration challenges and solutions. The competitive rules governing these industries are well understood. In addition, the financial industries are known for a high level of IT-dependency, increasing the prospect that IT-related

issues should manifest and not be marginalized in the overall integration process. Studying these industries has drawn our attention to the critical role of IS integration in enabling acquisition benefits, including economies of scale and scope, that typically drive acquisitions in these industries.

While IS integration issues certainly are important in manufacturing and financial industries, we find it unlikely that research on other industries would to the same IS integration challenges and solutions. In digital industries, for example, much of the logic of competition is contingent on an innovations arms race, rather than by economies of scale and scope. The lack of research on digital industries is certainly linked to the lack of research on technology acquisitions. Frequently, access to innovative technologies and related capabilities are components of the rationale behind many larger acquisitions. In those acquisitions, the specific opportunities and challenges of technology acquisition may be confounded with the other factors and processes.

Finally, the limitations of industries studied also means that organizational forms and competitive strategies that are more prominent in other industries have not been addressed in the extant research. These include platform-based organizations and firms that compete with system-based offerings. In industries with system-based competition, such as the software industry, companies typically market suits of complementary products, rather than stand-alone products. Customers typically purchase software products as a system of complements (e.g., office productivity suite as a whole) rather than as stand-alone products (e.g., word processor, spreadsheet, and presentation package alone) because software must interoperate. Hence, for a firm that is developing a complementary product suite, an essential question of relatedness is whether the products of the two companies are, or can be made, interoperable. For WMware, it is the ability to create suites of complementary products that is the key driver for its many acquisitions[4].

The explanation of the many innovation-based acquisitions by platform organizations such as Apple, Twitter and Facebook lies within the IS domain. However, the extant literature provides limited explanation of these actions and their chances of success. Platform organizations are fundamentally different from MBOs in the way they compete by adding products and services to their platform. Many platform companies are at a tipping point (value or growth). The ability to grow depends on strategic innovation and acquisitions to establish and exploit market adjacencies. The majority of large companies in this sector are serial acquirers but very little research has been conducted in this area.

[4] http://www.vmware.se/company/acquisitions#sthash.WikQX6db.dpuf

7.4 Methodology

In the general literature on M&As, nomothetic studies based on quantitative data (surveys and empirical studies) outnumber the ideographic studies based on qualitative data (single and multiple case studies) by a factor of 20 (Bengtsson & Larsson, 2012). In the extant research on IS integration issues in M&As, only 11 of 47 identified publications were based on survey or empirical data. 18 of 47 papers were based on single or multiple-case studies. However, when investigating the extant research on IS-enabled organizational transformation (of which we can consider M&A as a specific case), Besson and Rowe (2012) found that research in this area almost unanimous was based on qualitative data sources. In comparison with this research, the ratio between qualitative and quantitative data sources seems more balanced in the area of IS integration and M&As.

Contrasting the use of data sources with the findings by Besson and Rowe (2012), M&A research seems to hold a specific position within the IS-enabled organizational transformation literature in the balance between quantitative and qualitative studies. This unique position is interesting, and perhaps a research subject in itself. We can only speculate on why this is the case. Possibly, research in IS integration in M&As draws on the legacy of general M&A research, which has defined and validated many of the constructs (addressing type of acquisition, short-term and long-term value creation, etc.) needed for IS-focused surveys. In addition, the mature terminology of the general M&A field has allowed IS researchers to identify large enough samples of this particular transformation. Finally, apart from the lack of IS details, all other information needed to model the impact of IS integration exists in publicly available databases, making the survey-based data gathering a relatively feasible exercise. We believe this legacy and data richness to be a unique characteristic of the field of IS integration in M&As, compared with other types of IS-enabled organizational change.

Looking forward, the balance between research approaches has been instrumental in the exploratory theory development that has taken place. Certainly, further case-based exploration will continue to be important to expand the current knowledge base to additional actors and types of M&As, yet to be addressed from an IS perspective. However, for the areas that are already relatively well covered, for example, the acquisition of individual business units, the need is to investigate empirically and to verify statistically the theoretical propositions that have been developed. Since the usual data sources for M&A research do not cover IS data, researchers need to create data sets of IS installation and IS integration strategies to combine with publicly available performance data.

7.5 Theoretical frameworks

Looking back, the literature reviewed frequently adopts one of four mainstream theoretical frameworks.

These are Alignment theory, Organizational Culture/Learning, the Resource-Based View and Strategic IS Planning. So, the findings in this literature review are not constrained by the dominance of one or two analytical frameworks.

These four frameworks are chosen explicitly from the general research literature rather than the outcome of research based on grounded theory methodologies. We speculate that it would be difficult to negotiate access to M&As for that form of research. Certainly, this method of research has a small presence in the IS M&A literature.

Contrasting the results with Besson and Rowe's (2012) review on the use of theoretical framework in the general research on IS in organizational transformation, two differences stands out. In Besson and Rowe's (2012), about one third of the papers in the sample did not base their research on any explicit framework. In addition, one third of the investigated papers were based on what the authors refer to as "unusual" theories. For IS in M&As, research has with a few exceptions been based on commonly used theoretical frameworks, indicating that the exploration of the domain has been more theoretically driven than the field of IS and organizational transformation in general.

Looking forwards, we suggest that IS M&A research should explore two issues. One is the validity of other theoretical frameworks that are adopted elsewhere in the M&A research literature. These would include, but not be limited to, negotiation theory, portfolio theory, and theories of adoption.

The other suggestion is to examine how specific assumptions in each of the four dominant theoretical frameworks have constrained research. For example, IS alignment theory typically assumes that misalignment can be corrected by changing the business strategy, the IS strategy or both (See, for example, Henderson & Venkatraman, 1993). If this is not the case and, as Reynolds and Yetton (2014) argue, misalignment accumulates over time in the IT investment cycle, then the analysis of serial acquisitions would be limited by this untested assumption. There is little analysis of the effects of such assumptions on the models developed in the literature reviewed in this paper, when selecting the theoretical frameworks adopted.

7.6 Nature of theory development

The articles reviewed above primarily focus on developing theories for analysis and explanation. Theories for prediction and design and action are limited or absent. Examining the interrelationships between theory types in Gregor's (2006) taxonomy, it is natural that research on IS integration in M&As has evolved from theories for analysis and explanation. Theories for prediction and design and action build on the other theory types.

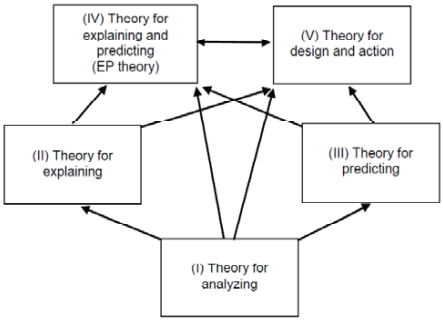

Figure 2. Interrelationships between theory types (Gregor, 2006)

The relationship between the theory types has two implications for how the research domains can evolve in the future. First, within the areas that are currently not covered by the extant research, the point of departure would be to explore theoretical frameworks required to analyse, explain and predict issues.

Second, the areas where theory for analysis and explanation is emerging, there is a possibility of building further on existing theory, developing theory for prescription and for design and action. Both opportunities are associated with challenges that must be overcome. To develop analytical and explanatory theory into predictive theory quantitate performance data would be beneficial. The difficulties with obtaining this data are discussed above.

To further development of analytical and explanatory theory into theory for design and action requires participation of companies involved in M&As to a level that may be hard to achieve. Carlsson et al. (2011) discuss the specific challenges of doing design research on IS integration in M&As. Design research is typically implemented through cyclical iterations between explanation, development of actionable guidelines, testing guidelines through use, and reflection on outcome of use. Given the value at stake in M&As, this reflective form of learning-by-doing is not possible in M&As where managers would be unwilling to experiment and take risks in their integration process (Carlsson et al., 2011). Therefore, design research on IS integration in M&As to a high degree must build on a solid explanatory foundation before naturalistic testing (real world use) can be done. In addition, complementary testing approaches will be necessary, including simulations, focus groups, and expert interviews before naturalistic testing can take place.

7.7 Research focus

Early research on IS integration in the context of M&As focuses on understanding the role IS in the

realization of acquisition benefits and outlines the major IS integration challenges involved. Subsequently, research refines our understanding of the challenges and investigates the capabilities needed to address them.

Focusing on the direct act of acquiring, the before and after consequences of acquisition have received less attention. The extant literature contributes little to understanding the actions and conditions that make an acquirer or merging company better positioned than another company. Consequently, little is known about what makes some acquirers better positioned than others to complete IS integration challenges. Initial research in this area suggests that serial acquirers can develop IS integration routines that match previous acquisition experiences. However, most acquisitions are not a direct match with previous experiences. Indeed, many acquirers make so few acquisitions that they do not develop efficient IS integration routines. So, how should these acquirers and merging partners attend to the IS integration challenges ahead? There are indications (Henningsson et al., 2007) that a modular IT infrastructure helps, by giving increased flexibility. But how does a high degree of outsourcing impact? Is a developed and mature Enterprise Architecture a beneficial starting point for some or all IS integration projects? Can any of the critical IT integration capabilities be sourced externally through consultants? These are only a few of the critical questions required to order to understand what makes a company IT-ready to acquire or merge.

The literature of IS integration in relation to M&As is also limited in its analysis of the direct impact on realization of acquisition benefits. We suggest that, for an acquiring or merging company, there are other, potentially more important long-term consequences than the degree of acquisition benefits realized. Many authors describe IS integration in M&As as fundamentally reshaping events in the life of organizations. An important avenue for future research is the investigation of how these IS integration projects influence the IT function of the organization, and the organization as a whole. We believe it is likely that these projects can have positive impact on the IT function by providing important learning experiences that enable more flexible IT resources or build the reputation of IT managers. The reverse is, however, also possible. Failure to support the corporate growth strategy can lead to a general decay in the reputation of the IT department, and addressing integration challenges consistently through patching systems together reduces IT agility.

8 Research directions

Our review above of what has been studied and what still needs to be done reveals that the 47 papers addressing IS integration issues in M&As have contributed a range of important insights. Collectively, extant research provides explanations for a range of IS-related issues in M&As. Our review also shows that we have merely scratched the surface of this multifaceted research domain. We have studied a narrow range of research objects with a narrow range of research methods. Within those studies, we have focused

on a small subset of issues related to IS in M&As. In general, research has focused on individual acquisitions of single-business units driven by economies of scale and scope. It has ignored acquisition programs, mergers between MBOs, and acquisitions driven by technological innovations.

Consequently, the agenda for further research is extensive. Here, we identify two ways that this could be addressed (Table 12). First, we call for a research program on management of the known – research that builds further on what is known about single acquisitions and mergers towards practical, useful knowledge for IS management. Second, we call for a program directed towards exploration of the unknown of serial acquirers, mergers of MBOs and technology acquisitions.

Table 12. Research directions for research on IS integration in M&As

Research program	**Focus areas**
Managing the known	Single acquisition and mergers - Conceptual refinement - Strategic contingencies - Espoused design theories in successful acquisitions
Exploring the unknown	Serial acquirers - Acquisition programs - Organizational performance - Antecedents to IS integration capabilities Mergers and acquisitions of MBOs - Platform integration - Improvisational learning - Third-party contribution Innovation-driven acquisitions - Hi-tech industries - Platform companies

8.1 Managing the known

To make impact for practitioners, there is a need to move the understanding of single acquisitions and mergers towards *theories for prediction and action*. A first step is further conceptual refinement. Increasingly, research recognizes that IS integration in M&As cover highly heterogeneous phenomena that cannot be addressed with one single strategy. IS integration strategies are subject to contingency factors and cannot be assumed to be universally applicable.

Distinguishing between acquisition and merger is only a first step. There is a need to further explore how the known issues impact different types of mergers and acquisitions, for example, identifying the relative importance of alignment in acquisitions driven by economies of scale or scope, compared with acquisitions driven by innovation. Here, nomothetic studies that investigate contingency factors across large samples of M&As are needed to identify the contexts in which challenges arise, and where known strategies to address them are applicable.

In addition, the technological dimensions of IS integration need further conceptual refinement and investigation to identify which technological features matter, and when they matter. A number of authors recognize the quality of the acquirer's technological infrastructure matter and call for more research on it (e.g. Wijnhoven et al., 2006; Henningsson, 2014). To date, little has been done beyond identification of the issue.

Finally, we need to advance from explanation and prescription to action. However, given the amount of money at stake in M&As, researchers are unlikely to convince acquirers to enact pre-defined design propositions in experimental applications. As an alternative approach, we suggest investigating the theories espoused in the IS integration strategies by successful acquirers. This research would focus on identifying the constituents of successful IS integration strategies and the boundary conditions for those strategies.

8.2 Exploring the unknowns

We see a need also to expand the path of research to the exploration of the many unknown facets of the phenomena. The above review of extant research identifies a long list of potentially interesting aspects, including *acquisition programs*, *acquisitions of and mergers between MBOs*, *serial acquirer challenges and opportunities*, *vendor and target pre-acquisition preparation*, *technology acquisitions driven by innovation potential*, *acquisitions by platform organizations and companies competing with system-based offerings*, *antecedents to IS integration capabilities* and *how engaging in M&As impacts the general IS capabilities*.

We suggest that research can approach these unknown aspects of IS integration in M&As through three broad streams of research directed to three empirical phenomena that have received little attention in the extant research: serial acquirers and acquisition programs, mergers and acquisitions between MBOs, and innovation-driven acquisitions.

First, 60% of all acquisitions are made by serial acquirers. Most of these acquisitions occur within acquisition programs. Given that this is repetitive action, this is where how the acquirer deals with the IS integration challenges would have most significant impact. It is likely that the effects of the integration stretch beyond the acquisition itself. Therefore, to understand IS integration in acquisition programs it will

be necessary to move from acquisition performance to organizational performance as the unit of analysis. In addition, while it may not be worthwhile for individual acquirers to focus on learning and improvement, they would be critical components of any growth-by-acquisition strategy. Hence, a focus on serial acquirers also implies a stronger focus on the antecedents to IT integration capabilities, including the extent to which IS integration in acquisition can be learnt and formalized in organizational routines.

Second, while large MBO mergers are not as common as small acquisitions, their sheer size and complexity make them important from an IS integration perspective. In these organizational combinations, the corporate platforms are subject to integration decisions, which makes them fundamentally different IS integration species. In contrast to repetitive smaller acquisitions, there is no opportunity to learn by accumulating experiences and establishing efficient routines within the organization. Instead, the parties involved must engage in improvisational learning where the organizations learn in real time as design and action converge (Miner et al., 2001) or learn by indirect, vicarious learning from other organizations that have faced similar issues (Haunschild & Miner, 1997; Ingram, 2002). In the latter process, external consultants with experiences of a number of large mergers may have merger models that accumulate knowledge experiences across mergers. The possibility of such third-party contribution to solving the challenge is one potential avenue for finding solutions to the merger challenge.

Third, technology acquisition is beneficially studied in acquisitions where innovative technologies and related capabilities are the prime motives (Sears & Hoetker, 2014). This entails investigation of hi-tech industries, where technology acquisitions are most frequent. Investigating hi-tech industries does, however, require careful consideration of how companies compete in these industries, including system-based competition and platform organizations. These aspects of technology acquisitions have not been addressed in the general management literature on technology acquisitions. Consequently, in this area IS researchers could draw on core theories of the IS discipline to inform a significant body of research currently struggling with the explanation of a major contemporary phenomenon.

9 Conclusions

The purpose of this review is to identify how to build further on the extant literature on IS issues in M&As. To do this, we look backward to see where we are and we look forward to see where we should go next. The 47 papers that have explored IS integration challenges in relation to M&As have done so by studying a narrow range of research objects with a narrow range of research methods, and, within those studies, focused on a small subset of issues related to IS in M&As.

To advance the research field, we suggest two research programs. The first should aim to deepen existing research focus by developing existing analytical and explanatory theory of IS integration in individual

acquisitions towards predictive and actionable theory. To broaden the research focus, a second research program should focus on IS integration in acquisition programs by serial acquirers, mergers of large MBOs, and acquisitions in hi-tech industries driven by access to technology innovations and innovative capabilities.

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Appendix A. Extant literature on IS/IT integration in M&As

	Author Year	Title	Outlet	Transaction	Chief actor	Industry	Data collection	Theoretical framework	Development aspiration	Research focus	Citations
1	Main & Short 1989	Managing the merger: Building partnership through IT planning at the New Baxter	Management Information Systems Quarterly	Merger	Merging Partner	Healthcare	Case Study - Single	Strategic IS Planning	Explaining	Capability	42
2	Buck-Lew et al. 1992	Accounting for Information Technology in Corporate Acquisitions	Information & Management	Individual Acquisition	Acquirer	Banking	Case Study - Single	Alignment theory	Explaining	Capability	37
3	Merali & McKiernan 1993	The strategic positioning of information systems in post-acquisition management	Journal of Strategic Information Systems	Individual Acquisition	Acquirer	Non-Specific	Survey	Corporate Strategy	Explaining	Challenges	42
4	Johnston & Yetton 1996	Integrating information technology divisions in a bank merger: Fit, compatibility and models of change	Journal of Strategic Information Systems	Merger	Merging Partner	Banking	Case Study - Single	Organizational Culture/Learning	Explaining	Capability	84
5	Stylianou et al. 1996	Corporate mergers and the problem of IS integration	Information & Management	M&A	Merging Partner	Non-Specific	Survey	Strategic IS Planning	Design and Action	Challenges	107
6	Weber & Pliskin 1996	The effects of information systems integration and organizational culture on a firm's effectiveness	Information & Management	Individual Acquisition	Acquirer	Non-specific	Survey	Alignment theory	Explaining and Predicting	Challenges	168
7	Giacomazzi et al. 1997	Information systems integration in mergers and acquisitions: A normative model	Information & Management	Individual Acquisition	Acquirer	Industrial	Survey	Corporate Strategy	Design and Action	Challenges	113
8	Robbins & Stylianou 1999	Post-merger systems integration: the impact on IS capabilities	Information & Management	M&A	Merging Partner	Non-Specific	Survey	Strategic IS Planning	Predicting	Capability	106
9	Alaranta & Viljanen 2004	Integrating the IS Personnel After a Merger - Managing Challenges and Opportunities	European Conference of Information Systems	Merger	Merging Partner	Non-Specific	Conceptual	Resource based view	Explaining	Challenges	9
10	Chin et al. 2004	The impact of mergers & acquisitions on IT governance structures: A case study	Journal of Global Information Management	Acquisition Program	Acquirer	Non-specific	Case Study - Single	IT Governance	Analysing	Capability	24
11	Hwang 2004	Integrating Enterprise systems in mergers and acquisitions	Americas Conference of Information Systems	M&A	Merging Partner	Non-Specific	Conceptual	Organizational Culture/Learning	Analysing	Challenges	19
12	Alaranta 2005	Integrating the Enterprise Systems after a Merger: Managing the Change in a Manufacturing Company	European Conference of Information Systems	Merger	Merging Partner	Manufacturing	Case Study - Single	Business Process	Explaining	Challenges	14
13	Holm-Larsen 2005	ICT Integration in an M&A Process	Pacific-Asia Conference of Information Systems	M&A	Merging Partner	Banking	Case Study - Single	Resource based view	Explaining and Predicting	Capability	16
14	Brunetto 2006	Integrating Information Systems during mergers: Integration modes typology, prescribed vs constructed implementation process	European Conference of Information Systems	M&A	Merging Partner	Real Estate / Construction	Case Study - Multiple	Alignment theory	Predicting	Capability	2
15	Henningsson & Carlsson 2006	Governing and Managing Enterprise Systems Integration in Corporate M&A	European Conference of Information Systems	Individual Acquisition	Acquirer	Manufacturing	Case Study - Single	Alignment theory	Description	Challenges	7
16	Wijnhoven et al. 2006	Post-merger IT integration strategies: An IT alignment Perspective	Journal of Strategic Information Systems	Individual Acquisition	Acquirer	Healthcare	Case Study - Multiple	Corporate Strategy	Analysing	Capability	103
17	Mehta & Hirschheim 2007	Strategic Alignment in Mergers & Acquisitions: Theorizing IS Integration Decision Making	Journal of Association for Information Systems	Individual Acquisition	Combined	Non-Specific	Case Study - Multiple	Alignment theory	Explaining	Challenges	61
18	Miklitz & Buxmann 2007	IT standardization and integration in mergers and acquisitions: a decision model for the selection of application systems	European Conference of Information Systems	M&A	Merging Partner	Non-Specific	Conceptual	Resource based view	Design and Action	Challenges	11
19	Vieru & Rivard 2007	Mind the gap: Positioning information systems/information technology within the process of post-merger integration	Americas Conference of Information Systems	M&A	Merging partner	Non-specific	Conceptual	Knowledge Management	Analysing	Challenges	3
20	Alaranta & Henningsson 2008	An approach to analyzing and planning post-merger IS integration: Insights from two field studies	Information Systems Frontier	Individual Acquisition	Acquirer	Non-Specific	Case Study - Single	Strategic IS Planning	Design and Action	Capability	26
21	Kathuria et al. 2008	Inter-Organizational Learning in Technology Acquisitions: Procuring More Than Knowledge	International Conference of Information Systems	Individual Acquisition	Acquirer	Non-Specific	Experiment	Organizational Culture/Learning	Explaining and Predicting	Challenges	0
22	LeFave et al. 2008	How Sprint Nextel reconfigured IT resources for results	Management Information Systems Quarterly Executive	Merger	Merging Partner	Telecommunications	Case Study - Single	Diversification Theory	Explaining	Capability	8
23	Lin & Chao 2008	Post-merger it integration: An IT culture Conflict perspective	Pacific-Asia Conference of Information Systems	Merger	Merging Partner	Banking	Case Study - Single	Resource based view	Explaining	Challenges	0
24	Myers 2008	Integration of different erp systems: The case of mergers and acquisitions.	Pacific-Asia Conference of Information Systems	M&A	Merging Partner	Non-specific	Expert interview	Organizational Culture/Learning	Analysing	Challenges	3
25	Rheaume & Bhabra	Value creation in information based industries	Information & Management	Individual	Acquirer	Media/	Empirical	Resource based	Explaining	Challenges	17

	2008	through convergence		Acquisition		Publishing		view			
26	Morsell et al. 2009	Post-merger technology integration: Influential organization and information systems factors	Americas Conference of Information Systems	M&A	Acquirer	Non-specific	Survey	Business Process	Explaining	Capability	0
27	Murphy & Platt 2009	Perceptions Of System Integration Success In Bank Mergers: Is Best Of Breed Best?	Americas Conference of Information Systems	Merger	Merging partner	Banking	Survey	Grounded	Explaining	Challenges	1
28	Neiderman & Baker 2009	Integrating Management Information Systems Following Organizational Mergers or Acquisitions	International Conference of Information Systems	M&A	Merging Partner	Non-specific	Survey	Resource based view	Explaining	Challenges	3
29	Parada et al. 2009	The internationalisation of retail banking: Banco Santander's journey towards globalisation	Long Range Planning	Acquisition Program	Acquirer	Finance	Case Study - Single	Strategic IS Planning	Explaining	Capability	13
30	Schonewille 2010	Integration process factors and effects.	Americas Conference of Information Systems	M&A	Merging Partner	Transport	Case Study - Multiple	Strategic IS Planning	Explaining	Challenges	7
31	Seddon et al. 2010	Post-merger IT integration: A comparison of two case studies	Pacific-Asia Conference of Information Systems	M&A	Merging Partner	Banking	Case Study - Multiple	Grounded	Explaining	Capability	1
32	Bohm et al. 2011	A dual view on IT challenges in Corporate Divestments and Acquisitions	International Conference of Information Systems	Individual Acquisition	Combined	Non-specific	Case Study - Single	Alignment theory	Explaining and Predicting	Capability	3
33	Henningsson & Carlsson 2011	The DySIIM model for managing IS integration in mergers and acquisitions	Information Systems Journal	Individual Acquisition	Merging Partner	Manufacturing	Case Study - Multiple	Resource based view	Explaining	Capability	21
34	Henningsson & Yetton 2011	Managing the IT Integration of Acquisitions by Multi-Business Organizations	International Conference of Information Systems	Acquisition Program	Acquirer	Manufacturing	Case Study - Multiple	Alignment theory	Predicting	Capability	1
35	Tanriverdi & Uysal 2011	Cross-Business Information Technology Integration and Acquirer Value Creation in Corporate Mergers and Acquisitions	Information Systems Research	M&A	Merging Partner	Non-specific	Survey	Resource based view	Explaining	Capability	33
36	Alaranta & Martela 2012	Overcoming Knowledge Gaps in Post-merger Integration: A Case Study	International Conference of Information Systems	Merger	Acquirer	Information Technology	Case Study - Single	Resource based view	Explaining	Capability	0
37	Benitez-Amado et al. 2012	Introducing IT-enabled business flexibility and IT integration in the acquirers M&A performance equation	International Conference of Information Systems	Individual Acquisition	Acquirer	Non-Specific	Survey	Knowledge Management	Explaining and Predicting	Capability	3
38	Eckert et al. 2012	Decision support for selecting an application landscape integration strategy in mergers and acquisitions.	European Conference of Information Systems	Individual Acquisition	Acquirer	Non-specific	Expert interview	Corporate Strategy	Design and Action	Capability	4
39	Gregory et al. 2012	Ambidextrous IS Strategy: The Dynamic Balancing Act of Developing an Transform & Merge Strategy in the Banking Industry	International Conference of Information Systems	Merger	Acquirer	Finance	Case Study - Single	Strategic IS Planning	Explaining	Capability	1
40	Lin & Shang 2012	An examination of the success of post-merger it integration.	Americas Conference of Information Systems	M&A	Merging Partner	Non-specific	Conceptual	Strategic IS Planning	Analysing	Challenges	0
41	Baker & Niederman 2013	Integrating the Is Functions after Mergers and Acquisitions: Analyzing Business-It Alignment	Journal of Strategic Information Systems	M&A	Merging Partner	Non-Specific	Case Study - Single	Resource based view	Analysing	Challenges	0
42	Garcia-Canal et al. 2013	Speed of ICT integration strategies in absorptions: Insights from a qualitative study	European Management Journal	Individual Acquisition	Acquirer	Automotive	Multiple Case - Study	Alignment theory	Explaining	Capability	0
43	Tanriverdi & Uysal 2013	When IT capabilities are not scale-free in merger and acquisition integrations: how do capital markets react to IT capability asymmetries between acquirer and target?	European Journal of Information Systems	Individual Acquisition	Merging Partner	Non-specific	Survey	NA	Analysing	Challenges	1
44	Yetton et al. 2013	Ready to Acquire': IT Resources for a Growth-by-Acquisition Strategy	Management Information Systems Quarterly Executive	Acquisition Program	Acquirer	Manufacturing	Case Study - Single	Resource based view	Explaining	Capability	3
45	Chang et al. 2014	Information systems integration after merger and acquisition	Industrial Management & Data Systems	M&A	Merging partner	High-Tech	Case Study - Single	Resource based view	Explaining	Capability	1
46	Henningsson 2014	Learning to acquire: How serial acquirers build organisational knowledge for information systems integration	European Journal of Information Systems	Acquisition Program	Acquirer	Manufacturing	Case Study - Single	Organizational Culture/Learning	Explaining	Capability	0
47	Vieru & Rivard 2014	Organizational identity challenges in a post-merger context: A case study of an information system implementation project	International Journal of Information Management	Merger	Acquirer	Healthcare	Case Study - Single	Organizational Culture/Learning	Explaining	Capability	0

Research Publication II

Toppenberg, G. *"Expanded Understanding of IS Related Challenges of Mergers & Acquisitions: Methods & Research Context"*, Presented at European Conference for Information Systems

EXPANDED UNDERSTANDING OF IS RELATED CHALLENGES OF MERGERS AND ACQUISITIONS: METHODS & RESEARCH CONTEXT

Complete Research

Abstract

Organizational Mergers and Acquisitions (M&As) occur at an increasingly frequent pace in today's business life. Paralleling this development, M&As has increasingly attracted attention from the Information Systems (IS) domain. This emerging line of research has started form an understanding of the challenges exacerbating related IT integration and the requirements on participating organizations to address these challenges. Extant literature has two limitations; the first limitation is that it has studied IT issues in M&As in a limited set of industrial domains, the second limitation is that it has relied almost exclusively on two research methods: case studies and surveys. This research has the potential to improve our understanding of challenges and solutions in M&A activity. In this paper, we adopted the focus group gathering technique (new method), specifically a 'less-structured' focus group process as well as the KJ method for analysis. We also used technology intensive companies as the research context (new industry domain) as they represent an unexplored industry with the potential for new knowledge according to Toppenberg & Henningsson (2013). Based on the analysis we identify gaps in the extant literature and suggest directions for future research.

Keywords: Acquisition, Integration, Post-Merger, Strategy, Merger, Focus Group, KJ Method

1 Introduction

Organizational Mergers and Acquisitions (M&As) occur at an increasingly frequent pace in today's business life. Paralleling this development, M&As has increasingly attracted attention from the Information Systems (IS) domain. This emerging line of research has started form an understanding of the challenges exacerbating related IT integration and the requirements on participating organizations to address these challenges.

However, reviewing the extant literature on IT integration in M&As, Toppenberg & Henningsson (2013) concludes that although significant progress have been made, extant research has only started to explore the IT-related challenges of M&As. Specifically, the author points to two specific limitations in the way that research has been carried out, that may have impacted the emerging understanding. The first limitation is that the extant research has studied IT issues in M&As in a limited set of industrial domains. Common for these industries are the strategies pursued by companies who motivated by product extension, market extension, vertical (supply chain/operations consolidation) and horizontal (business consolidation), which each is indicative of the rules of competition in these commodity markets that are driven by different competitive dynamics. The industrial context generally frames challenges and solution related to any strategic initiatives (Chiasson & Davidson, 2005). For M&A, specifically, different industrial contexts have been found highly correlated with the underlying reasons for M&As. For example, in the financial sector banks are typically engaged in horizontal M&As motivated by economies of scale, while vertical M&As to 'move up' in the value chain has been common on European and North American manufacturing industries (e.g. H&M and SolarCity).The second limitation is that the extant research has relied almost exclusively on two research methods: case studies and surveys.

Addressing these limitations in the extant research on IT issues in M&As, this paper present a study of IT integration issues in the US hi-tech industry, based on a focus group research method. For companies in hi-tech industries (software, hardware, ecommerce, internet), IT is not only a support function but also the product or solution being acquired, and acquisitions are motivated by very different reasons than those mentioned earlier (eg. to complement innovation management). In addition, the competitive dynamics with fast innovation cycles and transient (ref) rather than sustainable competitive advantages are different we expect that M&As will reveal new insights.

To study IT integration challenges in this industry context, we adopted the focus group gathering technique, specifically a 'less-structured' focus group process. Less-structured approaches to focus groups are especially useful for exploratory research (Morgan, 1997). Given the interest in understanding the participants' challenges while leading the acquisition integration process, the less-structured focus group was an ideal format.

The formal research question guiding the research is:

> ***RQ:*** *What firm-level M&A integration issues exist in high-tech companies that can motivate an extension of the research agenda of IS/IT in M&A?*

As where and how a phenomenon is studied impacts the conclusions that can be drawn about it, these we hope that this new take on the phenomenon of IT integration in M&As can bring our attention to new challenges implies that current research has only given attention to a minor subset of all IT-related challenges associated with M&As (Toppenberg & Henningsson, 2013).

The chapters that follow are divided into six sections. The next section covers a review of the literature included in the research and its relation to the research question. Following is the research method section which details the data gathering methodology, data analysis methodology and research context. The findings section lays out the data analysis results from the focus group at the firm level. The next section connects the firm level issues with IS/IT relevant issues finally we discuss the contributions to theory and practice, research limitations, directions for future research, and present a short conclusion.

2 Literature Review

Definition: in much of the research on IS integration issues in M&As, no distinction is made between merger and acquisitions. The distinction is claimed to be only legal and not relevant from an IS perspective. To maintain terminological consistencies, this paper use the term post-merger IS integration with reference to the process of integrate the IS of the two parties in the organizational combination, regardless of the juridical definition is acquisition or merger.

Extant research has highlighted three knowledge domains of relevance to understand challenges and solutions to post-merger IS integration; they are integration capabilities, integration process and method, and integration outcomes (Table 1). Following is a brief review of the research that has it primary contribution in one of these knowledge domains and summarized in figure 1..

	Table 1. Knowledge domains of extant literature	
Knowledge domain	**Description**	**Papers in category**
Integration Capabilities	This knowledge domain represents the collective theoretical body of knowledge on the capabilities managers employ to manage the diagnosis and implementation phases of an integration	Bannert & Tschirky (2004), Merali & McKiernan (1993), Mehta & Hirschheim (2007), Wijnhoven et al. (2006), Robbins & Stylianou(1999), Mehta & Hirschheim (2004), Johnston & Yetton (1996), Engert et al. (2010), Tanriverdi & Uysal (2013), Yetton et al. (2013)
Integration Process & Methodology	This knowledge domain represents the collective theoretical body of knowledge on the processes that managers follow in the integration.	Engert, Kelly & Rosiello (2010), Goedhart et al. (2010), Henningsson & Carlsson (2011), Davis (2012)
Integration Outcomes	This knowledge domain represents the collective theoretical body of knowledge on the capabilities managers use to measure the outcomes of the integration and address any issues that emerge relating to the performance, specifically the value created from the acquisition.	Lin & Chao (2008), Rothaermel (2008), Haspelaugh & Jemison (1991), Epstein (2004), Tanriverdi & Uysal (2011), Sarrazin & West (2011)

Table 1. Knowledge domains of relevance in extant literature

2.1 Integration capabilities

This knowledge domain represents the collective theoretical body of knowledge on the capabilities managers employ to manage the diagnosis and implementation phases of IT integration.

Diagnosis of IT integration is the focus of four papers in the extant literature. The strategic positioning and alignment is the focus of two papers specifically (Merali & McKiernan, 1993; Mehta & Hirschheim 2007) they contribute to the extant literature by highlighting the decisions managers must make in the post-acquisition phase. Two additional papers focus specifically on the value creation and synergy diagnosis of M&As (Engert et al., 2010; Tanriverdi & Uysal, 2013) the researchers provide a perspective on finding and prioritizing synergies and acquirer value creation. Lastly, Yetton et al. (2013) provides a contribution to the extant literature that helps to get acquirers 'Ready to Acquire', with a focus on integrating IT Resources for a 'growth-by-acquisition' strategy.

Capabilities focused on the implementation of an integration is the focus of six additional papers in the integration capabilities knowledge domain. The capability of determining the most suitable implementation strategy and assessing capability fit is the focus of four papers. Alaranta & Henningsson (2007) & Wijnhoven et al. (2006) both focus on the process of shaping IS integration Strategy. Mehta & Hirschheim (2004) presents a framework for assessing IT integration decision-making in M&As, while Johnston & Yetton (1996) contribute with and with a framework that focuses on fit, compatibility and models of change. Two additional papers here (Robbins & Stylianou, 1999; Bannert & Tschirky (2004) look at the impact on IS capabilities and highlight challenges specific to technology intensive acquisitions.

2.2 Integration process and methods

This knowledge domain represents the collective theoretical body of knowledge on the processes that managers follow in the integration. The body of knowledge is divided into three areas; the operational processes, the offering processes and the development processes. Four papers make a contribution with a focus on the integration process and methods. The focus in this knowledge domain is on the operational aspects of the integration process (3 papers) while only one paper focuses on the offering aspects (i.e. the business value, the customer, business models and the sales process) and the development aspects (i.e. research & development and innovation management).

Three papers focus primarily on the operational aspects of the integration process and methods. Engert, Kelly & Rosiello (2010) present findings from their research on the topic of organizational culture in M&A. Goedhart et al. (2010) present five types of successful integrations with a focus on the operational aspects of these integrations. Henningsson & Carlsson (2011) contribute with the DYSIIM model for managing IS integration in mergers and acquisitions. In addition, one paper has a focus on the offering & development aspects of integration; these are focused on the business success. Davis (2012) looks at M&A Integration, a practical guide for planning and delivering M&A integration for business success.

2.3 Integration outcomes

This knowledge domain represents the collective theoretical body of knowledge on the capabilities managers use to measure the outcomes of the integration and address any issues that emerge relating to the performance, specifically the value created from the acquisition. The body of knowledge is divided into two areas; the acquisition performance and the organizational performance. Six papers make up this knowledge domain, with a focus on acquisition performance (4 papers) and organizational performance (2).

Acquisition performance is the focus of four papers. The strategic value of IT in M&A and the role of technology competitive advantages is the focus of two papers (Rothaermel, 2008; Sarrazin & Wet, 2011). While Epstein (2004) focuses on the drivers of success in the Integration process and Tanriverdi & Uysal (2011) investigate how IT capabilities are not scale-free M&A integrations.

Lastly, two papers investigate the organizational performance factors in IS M&A. Lin & Chao (2008) look at post-merger IT integration: with a focus on IT culture conflict perspectives and Haspelaugh & Jemison (1991), a seminal article in the domain of IS/IT in M&A look at how to create value through corporate renewal.

The frameworks and models chosen for this conceptual review represents the comprehensive and cross-disciplinary work across IS/IT, strategic management, and organizational design of 19 researchers or research teams. At an aggregate level the extant papers are aligned into the following figure 1. This view represents the extant literature across all investigated industries and utilizing primarily case study research, given the research question the next area of focus is to determine if gaps exist in our knowledge base when looking closer at the high-tech industry.

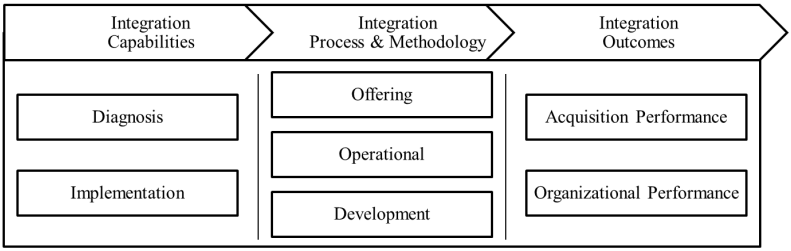

Figure 1. Knowledge domains and subsequent focus areas of the extant literature

3 Research Method

Given the motivation of seeking an expanded understanding of IS/IT related challenges of M&A through the process of interacting directly with practitioners through action research, we used a less-structured focus group process. Less-structured approaches to focus groups are especially useful for exploratory research (Morgan, 1997). Given the interest in understanding the participants' challenges while leading the acquisition integration process, the less-structured focus group was an ideal format. As in this case, when the basic issues are poorly understood or existing knowledge is based on researcher-imposed agendas, then an unstandardized interview guide will provide the opportunity to hear the interests of the participants themselves in each group. In addition, minimizing the moderator's involvement in the discussion will give the participants more opportunity to pursue what interests them.

According to Fern (2011, pg. 5), "Exploratory tasks include creating new ideas; collecting unique thoughts; identifying needs, expectations, and issues; discovering new uses for existing products or discovering new products; and explaining puzzling results from quantitative research." Given the exploratory nature, the phase of the research, and the desire to learn something new, the less-structured focus group was ideal. The researchers letting the participants speak freely without an agenda and without much guidance from either the researchers' questions or the moderator's direction allowed the participants to explore the challenges in the acquisition integration process. The focus group process used is based on Kirk and Miller's (1986) general description of the four phases of qualitative research: planning, observation, analysis, and reporting.

3.1 Planning phase

The decision was made to utilize a 'less structured' focus group, as the approach to focus groups is especially useful for exploratory research, where basic issues are poorly understood or existing knowledge is based on researcher-imposed agendas. The approach was chosen as it encourages the use of an unstandardized interview guide that will provide the opportunity to hear the interests of the participants themselves in each group. Participants were chosen because of their specific knowledge and skills in leading and managing mergers and acquisitions in technology intensive organizations. According to Morgan (1993) there are several "rules of thumb" when conducting focus group interviews. According to these rules of thumb, focus group projects most often have 6 to 10 participants per group and have a total of three to five groups per project. Following in Table 2 is a representative sample of one of the three focus groups conducted. The list includes information on participants by role, company type, and number of acquisitions.

Table 2. Focus Group #1 Participants Summary

Company ID#	Company type	Job Title/Role of Interviewees	# of acquisitions (as of November – 2014)[1]
1	Hardware & Software	SVP & Director - Head of Acquisition Integration	161
2	Networking	Director - Head of Acquisition Integration	160
3	Internet	Director - Head of Acquisition Integration	147
4	Hardware & Services	Director - Head of Corporate Development	135
5	Hardware	Director - Head of Acquisition Integration	111
6	Internet	Director - Head of Corporate Development	102
7	Software	VP & Director - Head of Acquisition Integration	90
8	Technology Vendor	Principal/Partner - Head of Acquisition Integration	60
9	Chipmaker	Director - Head of Acquisition Integration	60
		Total:	1026

Table 2 – Focus group participants

3.2 Observation, analysis and reporting phases

Given the exploratory nature of the focus group and the availability of a professional focus group moderator the researcher chose to follow the steps of the KJ method of observation, analysis and reporting. The KJ method was developed by, and named after, Jiro Kawakita[2]. The KJ method is known as a method for establishing an orderly system from a chaotic mass of information. The KJ method involves the systematization and converging of brainstorming. The feature of the KJ method is cooperative work toward insights. The KJ method consists of four steps which were employed by the researcher in the focus group, see Fig. 1 for process details and table 3 for the steps.

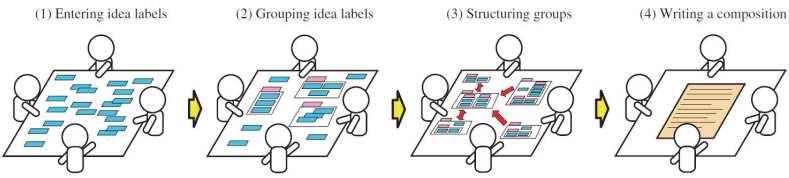

Figure 1 – The process of the KJ method – (Shigenobu & Munemori, 2007)

Extending this process the researcher utilizes the compositions and the material from the focus group to identify the core focus areas that have the highest affinity for the focus group, this process is highlighted in figure 2. In this paper we will focus on the firm level issues (table 4) identified first then identify gaps in the extant literature (table 5) then extrapolate the IS/IT impacts and issues (table 6).

[1] Acquisitions from each company – http://www.wikipedia.org

[2] Jiro Kawakita - http://en.wikipedia.org/wiki/Jiro_Kawakita

	Table 3. Steps of the KJ method	
Step	**Description**	**Results**
Entering ideas	In the first step, participants can write ideas on paper labels freely. One label represents one idea. Participants enter their ideas on a theme, and they write down each idea on a tag (a small piece of paper, e.g., Post-It note) and put them on a table. Participants must propose their ideas without hesitation. This step corresponds to brainstorming.	Each focus group entered ideas based on their current knowledge and experience; they were left to enter ideas in silence and produced an average of 150 tags. Introductions were not conducted until following this step for the purpose of eliminating the possibility of identifying 'experts' in the room
Grouping ideas	In the second step, participants examine these tags and group them into groups through discussion. The criterion for this grouping is not the category of ideas but their similarity. Each group is called an island and given a representative title. The island is a technical term in the KJ method, and the set of similar ideas.	Each focus group grouped the ideas based on their similarity and were encouraged to discuss and question the different tags as they negotiated the appropriate alignment to a category.
Structuring groups	In the third step, participants look for an arrangement that expresses the mutual relations of the representative titles spatially. Then they connect the related representative titles together in a certain line	Each focus group structured their tags into unique groups; most groups however identified the same categories across focus groups but named them slightly differently.
Writing a composition	In the last step, participants write a summarized composition. They should not express their opinions but should write it based on the data itself.	To provide the research team with a narrative format of the categories the focus groups created a high-level narrative and presented the findings to the moderator of the focus group while the researcher observed silently.
Identify core focus areas	In this additional step the researcher utilizes the compositions and material from the focus group, identifies core areas of focus, then compares them to extant literature and determines gaps and opportunities for future research	The researcher identified several areas of firm level issues, then compared them to extant literature and determined the gaps and opportunities for future research.

Table 3 – Steps of the KJ method

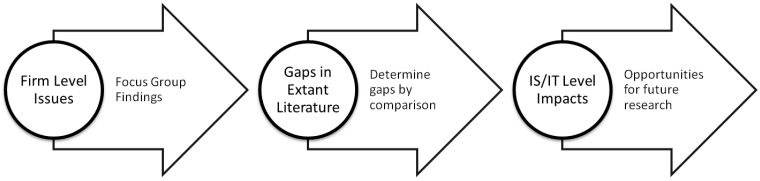

Figure 2.The process of narrowing down from the firm level to the IS/IT level challenges/impacts

4 Findings

Following the process above, the focus groups identified specific firm level issues. The firm-level issues identified by the focus group participants were then compared to extant literature and aligned to one of the knowledge domains; Integration capabilities, Integration process & methodology or Integration outcomes. The purpose of this section is to determine which of the firm-level issues are related to extant literature and which may lead new research opportunities for IS/IT researchers.

Following is a narrative description of each firm-level issue and a table identifying the potential gaps (Table 4.)

4.1 Firm-level issue #1 - Diagnosis

Sub-Area 1.1: Structural Fit and Target State – An acquisition integration team determines the architectural target state and structural fit of organizational and operation components of the target company within the acquiring enterprise. The challenge expressed was the ability to master this task while balancing the unique nature of each acquisition. Several participants did not employ this process and found it interesting.

> *We use a software tool for the development of a target state that allows us to prioritize our efforts. Initially we used it to learn about previous deals by going through and rating and grading them retroactively. The first deal we used it on, we completely changed the deal strategy, so not just the integration strategy but the acquisition strategy. The original deal strategy came up with a medium score, showing us that the proposed deal would add major expenses and complexity but add only incremental technology to our product offering. Allowing us to get a good idea of what the target state would look like helped us avoid a major investment that would have been a value destroyer from day 1; instead, we acquired only the technology from the target and not the entire company.*
>
> *– Focus Group #3 Participant #2*

Sub-Area 1.2: Value Drivers/Cost Synergies – The focus group identified this as a challenge, identifying and capturing value drivers and cost synergies that were objective and measurable throughout the life cycle of the acquisition integration. In addition, the challenge in this area was on tracking the delivery of fulfilment of these drivers and synergies.

4.2 Firm-level issue #2 - Hand-offs

Sub-Area 2.1: Connecting deal team to integration team and transitioning ownership from integration team to Operations – The focus group identified several cards in these affinity groupings, especially in the area of translating the rational of the deal, the value drivers, to the execution team, ensuring that the deal value would not be destroyed in the process of integration. They also identified challenges in the handoff from the integration team to the business unit or operations unit in charge of the ongoing ownership and maintenance of the integration component.

> *The ability to hand-off from deal team to integration team has been evolving over the past four-five years. When I first started in this area of acquisitions, within 15 days after close, you could not even get the deal guys on the phone; they were just like thank you very much, have a nice life, good luck.*
>
> *We now generally have had good "deal leads" on the integration committee the first two years post-close. So they are still involved and still keep apprised on the status of the integration. They have a say on accountability and track what we are delivering, if we are successful, or if we are missing the mark.*
>
> *–Focus Group #1 Participant #7*

4.3 Firm-level issue #3 - Offering & Development

Sub-Area 4.1: New Business Models and Go-to-Market – The focus group participants focused much of the conversation and deliberation on this set of affinities as it represented one of the core elements of challenge for most of the organizations. Several of the organizations used the "acquire and integrate innovations*"* process to non-organically add innovations to their product portfolio by acquiring small companies for "tech and talent." The companies represented a new or adjacent

business model in many cases to the core product portfolio along with different go-to-market models that included new pricing and billing models such as pay-per-use or subscription models.

Sub-Area 4-2: Sales Enablement –The focus group participants also identified sales enablement as a challenge. The ability to bring the product to a new market segment or to capitalize on bringing an existing customer base a new product offering depends largely on the ability to train up the sales force of an organization. Focus group participants identified both business process and systems issues particularly as they related to the area of sales compensation.

> *Integrating new business models that are dissimilar to our own is challenging. We start by planting our own resources in the target or the acquired business, so that we have a better idea of how they do business. What we're finding is that these really unique businesses have very different business models. We realize that they have a very different way of doing business, and we want to understand this process so we don't kill the business.*
>
> *-Focus Group #1 Participant #4*

Sub-Area 4.3: Integration of research & development teams - This was a concern identified across the focus groups. In technology intensive organizations and industries the impact of integrating the R&D team into the acquiring entity is critical to the ability to attain the value from the acquisition. This could be either as an early state product under development or a mature product being integrated into another offering.

4.4 Firm-level issue #4 – The Core

Sub-Area 5.1: Leadership – In particular the focus group found aligning the leadership teams of the acquiring company and the acquired company as representing challenges in the acquisition integration process. Ensuring a strong alignment and on boarding the leadership team of the acquired company was identified as a success factor given the influence they have on the rest of the key talent of the acquisition.

> *Leadership alignment is vital to ensure sustainable results from our acquisitions. It can be very difficult to ensure the leadership alignment when leaders in our business units do not stay in the same role for the duration of an integration. It is also important that we ensure the leadership team of our target is well aligned with the leadership team in our company and the business unit leaders in the overall strategy for the acquisition.*
>
> - *Focus Group #2 Participant #6*

Sub-Area 5.2: Project Management, Governance, Planning, and Change Management – These elements represent the most traditional and fundamental challenges, most of which have been extensively researched and theorized about across many other disciplines. They continue to remain one of the most difficult areas to address, however, by practitioners given how fractured and federated many of the integration teams are in these organizations. Ensuring a standardized approach of execution and experience is extremely difficult.

Sub-Area 5.3: Scale and Agility – Most of the organizations who participated in the focus group were identified as serial acquirers, those that acquire and integrate multiple companies in a calendar year. To most of the organizations, the ability to scale the back-office of the acquiring organization to accommodate new business units and the ability of the acquired company to scale its unique operational capabilities to support a new set of customers represent challenges both from a process and systems perspective.

Sub-Area 5.4: Integration Expertise – The ability for the integration team to continue to learn from previous acquisitions remains a challenge for organizations, though several focus group participants represented companies that have adopted organizational learning practices such as retrospectives and lessons-learned to capture key information that allows them to optimize the process and fine-tune specific elements of the process.

4.5 Firm-level issue #5 - Stakeholders

Sub-Area 3.1: Customer and Employee Experience – Both were identified as representing challenges for the majority of the focus group participants and represented companies. The integration impacts on customers of both the acquiring company and of the target in the form of ordering, support, and service were the most common impacts. In terms of the employee, the on-boarding, retention of talent, and the area of a global workforce were common themes in this area.

Table 4. Focus Group Findings

Extant Knowledge Domain (Table 1)	Firm level-issue	Description	Potential Gaps in Extant Literature
Integration Capabilities	**#1 - Diagnosis**	Firm level issues on determining the target state and structural fit of organizational and operation components of the target company within the acquiring enterprise as well as how to identify and track synergies.	Findings in this area suggest that the speed of technological innovation is motivating high-tech companies to determine how they can leverage capability-based planning or enterprise architecture as a method of attaining speed to market for its acquisitions.
Integration Process & Methodology	**#2 - Hand-offs**	Translating the rational of the deal, the value drivers, to the execution team, ensuring that the deal value would not be destroyed in the process of integration.	Findings in this area were consistent with the extant literature and does not motivate research in potential gaps
	#3 - Offering & development	A focus on the areas of the integration process of new business models, the go-to-market methods of a firm, the enablement of the sales force and the product life-cycle.	Findings in this area suggest some significant opportunities in the area of the integration process, specifically in the areas of sales enablement, the integration of research & development teams given motivation for technology acquisitions, and the product life-cycle processes such as supply chain.
	#4 - The core	Addresses the core element of integration, specifically the areas of leadership alignment, project management, communications and integration expertise.	Findings in this area were consistent with the extant literature and does not motivate research in potential gaps
Integration Outcomes	**#5 - Stakeholders**	Impacts on customers of both the acquiring company and of the target in the form of ordering, support, and service. In terms of the employee, the on-boarding, retention of talent, and the area of a global workforce were common themes in this area.	Findings in this area were consistent with the extant literature and does not motivate research in potential gaps

Table 4 – Focus group findings

4.6 Impact of findings on IS & Opportunities for future research

Focusing specifically on the areas above in table 4 where the extant literature has not been developed the following firm-level issues that could be researched further as they have an impact on IS/IT level issues. These firm-level issues include; 'offering & development' as well as the 'deal rationale'.

Below we explore what the potential opportunities are for future research given this knowledge (table 5.)

Table 5. Impact of findings on IS & Opportunities for future research

Firm Level Issue	Firm Level Sub-Issue	Description	IS/IT Level Issue & Impact
#1. Diagnosis	**1.1 - Structural Fit and Target State**	Determining the architectural target state and structural fit of organizational and operation components of the target company within the acquiring enterprise.	The challenge expressed was the ability to master this task while balancing the unique nature of each acquisition. For IS/IT integration managers the choice is how to leverage enterprise architecture to manage the integration.
#3. Offering & Development	**3.3 - Integration of research & development teams**	In technology intensive organizations and industries the impact of integrating the R&D team into the acquiring entity is critical to the ability to attain the value from the acquisition. This could be either as an early state product under development or a mature product being integrated into another offering.	As new R&D teams with differing product development life-cycles and methodologies are integrated IS/IT teams will need to address the growing number of dependent systems for these teams, this includes the areas of agile & rapid development along with the need to ensure the high availability of these systems.
	3.2 - Sales enablement	The ability to integrate the sales team from the acquired entity is critical to the success of realizing the value of the acquisition as well as the integration of product offerings into the current selling motion of the existing sales team.	As new sales teams are integrated the IS/IT managers responsible for integration will need to address the sales, compensation and marketing IS/IT capabilities to support these areas. The ability for a customer to order an integrated product or service is the most frequent metric for success by the focus group participants, the dependence on the IS/IT systems to make this possible is significant.
	3.3 - Integration of new business models	Technology intensive organizations utilize M&A as part of their innovation management program and therefore acquire non-similar business models or new business models. The integration of these cause issues in the areas of the product offerings, value propositions and other areas.	As technology intensive organization continue to acquire and integrate new and different business models there is an opportunity for the IS/IT team to determine the need for reverse integration of capabilities as well as manage th landscape of capabilities supporting these new business models and build out new capabilities if needed.
	3.3 – Integration complexities in Go-to-Market area	The acquisitions of new business models disrupt the areas in the go-to-market area, including pricing and billing models such as pay-per-use or subscription models.	As the shift from similar or known business models to new and different models occur the IS/IT managers also need to address the need to manufacture, ship, price and recognize revenue in different ways. Particularly the shift to "software as a service" can present an issue for traditional hardware or boxed software companies. The IS/IT capabilities will need to change to address these firm level changes.

Table 5 – Impact of findings on IS/IT & Opportunities for future research

5 Discussion and conclusion

This paper presented a study of IT integration issues in the hi-tech industry, based on a focus group research method. The focus group gathering technique, a research method not used in extant literature was chosen since it was especially useful for exploratory research (Morgan, 1997) given the interest in understanding the participants' challenges while leading the acquisition integration process.

5.1 Discussion

The findings from the focus groups suggest a significant area of firm level issues that pertain to the area of the offerings & development as well as the diagnosis knowledge domains of an acquisition. Specifically, the areas of R&D team integration, sales enablement, new business models and the go-to-market/product-life-cycle were highlighted as well as the structural fit and target state. Each area has a significant impact to the IS/IT managers and the five areas represent gaps in the extant literature. Figure 3 represents and updated view of the previously presented aggregate view of extant literature highlighting the areas with gaps identified.

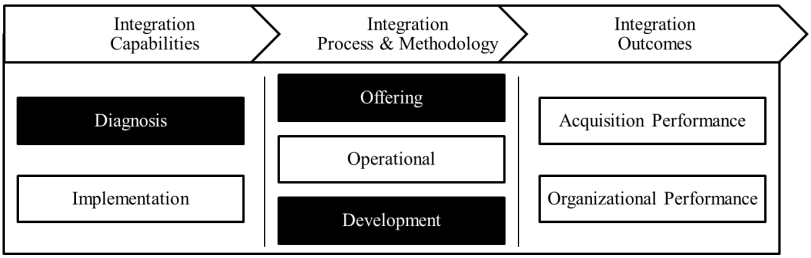

Figure 3 – Aggregate view of the extant literature & focus group findings

The research presented in this paper is an initial step in the direction of extending the research agenda on IS/IT issues in M&A. It is motivated by the gap identified by Toppenberg & Henningsson (2013) acknowledging that the high-tech industry is underrepresented and that further research in this area could reveal new areas of research.

5.2 Limitations and future research opportunities

The current research has multiple limitations; specifically the use of focus group limits the representation of the industry to only a few representatives. The focus group is explorative in nature and is therefore meant as an initial step in the process. Given the areas of IS/IT level issues based on the firm level issues identified there is now an opportunity to further investigate the IS/IT level issues as well as the firm level issues further through case studies.

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Research Publication III

Toppenberg, G. & Henningsson, S. “Technological integration of acquisitions in digital industries: a case study”, to be presented at The 75th Annual Meeting of the Academy of Management

Digital platform acquisitions: Value creation and technological integration challenges

Research Paper

ABSTRACT

Acquisitions have become essential tools to retain the technological edge in digital industries. This paper analyses the technological integration challenges in such acquisitions. Acquirers in digital industries are typically platform leaders in platform markets. They acquire (a) other platform providers to extend the platform core and to derive network effects by consolidating platform user groups, and (b) complement providers to create monopoly positions for the complements and for innovation complementarity. To enable these acquisition benefits, acquirers face technological integration challenges in process and product integration. Through a case study of Network Solutions Corp. (NSC), a Fortune 500 company that has acquired more than 175 business units, we develop four propositions explaining how the benefits of platform core and complement acquisitions are differently contingent on technical process and product integration.

Keywords

Platform, digital industry, acquisition, integration

Digital platform acquisitions: Value creation and technological integration challenges

Research Paper

1 Introduction

In industries based on digital technologies (henceforth referred to as *digital industries*), firms compete extensively on innovations that create transient competitive advantages (Brown & Eisenhardt, 1997; D'Aveni, 1999; D'Aveni Richard & Gunther, 1994; McGrath, 2013). But technological innovation activities are subject to path dependency (Cyert & March, 1963; Kogut & Zander, 1992; Nelson & Winter, 1982) and time compression diseconomies (Dierickx & Cool, 1989) that limits internal innovation possibilities. Moreover, smaller and younger firms are frequently more innovative than large, established firms (Zenger & Lazzarini, 2004). This is in particular true for truly groundbreaking innovations that radically transform industries innovations (Balasubramanian & Lee, 2008; Sørensen & Stuart, 2000). Therefore, acquisitions have become essential tools to retain the technological edge in digital industries (Kale et al., 2002; Leonard-Barton, 1995; McEvily et al., 2004).

Recently, companies acting in digital industries has been involved in several high profile acquisitions, including Facebook's acquisitions of Instagram and WhatsApp, Google's acquisitions of YouTube and Motorola, eBay's acquisition of PayPal and Microsoft's acquisitions of Skype. In fact, companies such as Apple, Google, Microsoft, Facebook, Twitter, Intel, Amazon, Oracle and Cisco all acquire a two-digit number of business units every year to access innovative technologies and innovative capabilities. The management of such acquisitions is, however, far from simple. Problems of implementation frequently beset them, and they are prone to high failure rates (Chaudhuri & Tabrizi, 1998; Hagedoorn & Duysters, 2002; Steensma & Corley, 2000).

But how do acquirers in digital industries mange to create value from acquisitions? Given that many of these acquisitions are undertaken explicitly to access innovative digital technologies, we expect that one part of this answer can be found in the technological integration of the acquisition.

Technological integration challenges are the subject of a stream of acquisition research that focuses on the IT integration of acquisitions (See G. Toppenberg & Henningsson, 2014 for reviews; G. N. Toppenberg & Henningsson, 2013). The general conclusion of this research is that to leverage synergistic effects between the two companies, the acquirer must diagnose and implement a mix of IT integration strategies that match the operational synergies sought.

Notwithstanding the value of the contributions made in this research, acquirers in digital industries are typically different from what is accounted for in this research in at least two different ways that can impact the technological integration challenges. First, the emerging insights about technological challenges has been gained exclusively from the study of traditional, 'low-tech' industries such as manufacturing, construction, finance and health care (Toppenberg & Henningsson, 2013; 2014). In these industries, value creation is typically organized in value chain or value shop configurations (Stabell & Fjeldstad, 1998). In contrast, digital industries are typically organized as platform markets. The platform is the third elementary type of value configuration as identified by Stabel and Fjeldstad (1998). Platform markets comprise a large and rapidly growing share of the global economy (T. Eisenmann et al., 2011). Ranked by market value, 60 of the world's 100 largest corporations earn at least half of their revenue from platform markets (T. R. Eisenmann, 2007). Because the value creation logic of chain, shop and platform markets differ, the mechanisms for acquisition value creation are also different. Therefore, in order to understand the technological challenges to value creation in digital industries, its essential to take the starting point in how acquisitions create value in platform markets.

Second, in digital industries, digital technologies are not only supporting business processes, but also the product that is offered to a market. From a product consumption perspective, digital platforms can be seen as a particular sort of technological system that is consumed as a whole, rather than through its individual constituents, a phenomenon also known as system-based competition (c.f. Katz & Shapiro, 1994). This is because digital products are highly complementary. Customers prefer to purchase digital products as a system of complements (e.g., office productivity suite as a whole) rather than as stand-alone products (e.g., word processor alone, spreadsheet alone, and presentation package alone) because digital products must interoperate. Therefore, the technological integration is two-fold: (1) to enable operational integration through business process integration, and (2) to enable offering integration through product integration. Consequently, when we talk about technological integration in the digital economy, we refer to both to the challenge of integrating the IS supporting business processes and the digital products offered in the combining business units.

With starting point in these two fundamental assumptions about the role of technology in digital industries, the research question addressed in this paper is formulated:

- *How is technological integration realized in digital platform acquisitions?*

We attend to this research question by an approach similar to analytic induction (Patton, 2002). An analytic induction approach starts deductively with the formulation of an initial framework, which is empirically validated and extended by analysis of case data. In this study, we develop our initial framework by analysing the literatures of platform-based markets and system-based competition from an acquisition perspective. This review identifies two distinct types of acquisitions (*platform core* and *platform complement* acquisitions), that present different value creating mechanisms, and two technical integration challenges (*process* and *product* integration). With basis in this framework we undertake a case study of Network Solutions Corp (NSC), a US-based firm with business in network equipment and services that have undertaken more than 175 acquisitions over the last three decades, to further analyze the technological process and product integration challenges in platform core and platform complement acquisitions. Through inductive analysis of NSC, we develop four propositions explaining how the benefits of platform core and complement acquisitions are differently contingent on process and product integration.

Combining the theoretical and empirical analysis, we make three important findings. First, it is important to differentiate between platform core acquisitions and platform complement acquisitions. The first creates value through increased same-side and indirect network effects, which leads to demand-side economies of scale and innovation economies of scope, respectively. The latter creates value through enabling a monopolistic position for the complement, generating pecuniary economies of imperfect competition as well as innovation complementarities by closer integration between platform core and complement.

Second, we find that the technical integration challenges in platform core and platform complement acquisition differ. To leverage value creation in platform core acquisitions requires less focus on technological product integration since the acquisition likely has a well-established product and the technical integration, unless disruptive, can be done over time and with customer input. Instead, in platform core acquisitions process integration is critical on since the acquisition will likely be a newly formed business unit and will need to exist with enterprise grade capabilities to support it. In contrast, to leverage value creation in platform complement acquisitions, technological product integration becomes more of a concern as a focus on 'time to orderability' of the new modified product. With respect to process integration this acquisition type is integrated with an absorption IT integration strategy. This allows for realize efficiencies and ensuring that the acquired technology is supported by needed capabilities as it is brought to scale across the platform.

Third, specifically for technological process integration, the extant literature has found that the main challenges of such integration usually can be found in the operation side of the company. In contrast, we find that for platform acquirers the main technological challenge on the offering side, what NSC refers to its "go to market-strategy". Not before the target is part of the NSC offering the company can start to reap the benefits of the acquisition. If operationally the two units need to be run separately, that is considered a minor inconvenience that typically is dealt with by recognizing the integration debt and establishing a

road map to close the gap. This is reflected in NSC having 'Time to orderability', in contrast to 'Time to cost benefits', as the principal criteria for integration evaluation.

2 Related literature

To analyze the technological integration challenges that have to be overcome in digital platform acquisitions, this section develops an initial analytical framework in two steps. First we review the literature on competition in platform markets. Doing so we identify two fundamentally different types of platform acquisitions that create value in distinct ways: platform core acquisitions and platform complement acquisitions.

Second, we review research related to system-based competition in digital industries to identify the role of technological product integration. While an emerging body of literature outlines the challenges of technical integration of business processes, less is known about the technical integration of digital products in acquisitions. However, drawing on related research on system-based competition and technological ecosystems, we argue that achieving product integration is an integration challenge at pair with process integration in digital industries.

2.1 Competition in platform markets

Platform markets mediate transactions across different customer groups, in which network effects fuel platform competition (Gawer, 2014). Ideal platform exchanges follow a triangular pattern. Users interact with each other, and simultaneous with platform providers. For example, video game networks have two distinct groups of users: players and developers. Developers sell games to players. Developers must also interact with the platform's provider (e.g., Nintendo) for permission to publish games. Finally, players must procure a console from the platform provider.

Users' interactions are subject to network effects, which are demand-side economies of scale: the value of platform affiliation for any given user depends upon the number of other users with whom they can interact (Economides, 1996; Katz & Shapiro, 1985). When platforms serve two distinct groups of users with mutual attraction, as with video game players and developers, they are said to be two-sided and present indirect network effects (Parker & Van Alstyne, 2005; Rochet & Tirole, 2003). Following Gawer (2014), indirect network effects give rise to economies of scope in innovation.

Technically, Baldwin and Woodard (C. Y. Baldwin & Woodard, 2009) highlight that all observed platforms share a structural commonality: that of a modular technological architecture (C. Baldwin & Clark, 2000; Ulrich, 1995), that is not only modular but also structured around a core and a periphery. In this view, "a platform architecture partitions a system into stable core components and variable peripheral components" (Baldwin and Woodard, 2009, p. 24). Figure 1 presents a schematic view of platform interactions, and the technical composition of platforms.

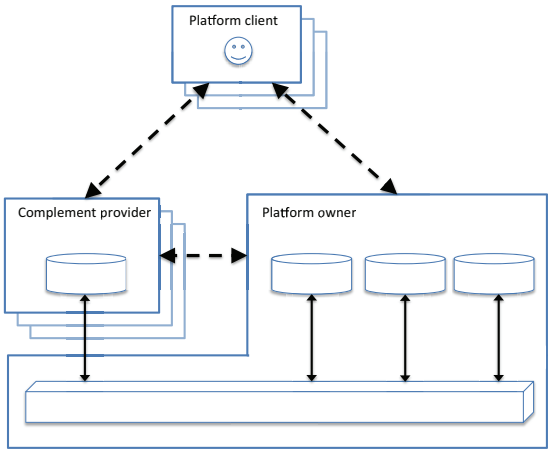

Figure 1. Platform interactions and the composition of platforms.

The platform core, created and maintained by one or more intermediaries, encompasses components and rules that define how users interact (T. R. Eisenmann, 2007; Gawer, 2014; Rochet & Tirole, 2003). In the video game example, the platform core would be the video game consol. On top of the core, developers build peripheral components, such as video games. From a consumer perspective, the core and the component are consumed together as a whole.

Platform markets are typically heavily dominated by the company that controls the core of the platforms, the "platform leader" ((Gawer & Cusumano, 2002) or "keystone firm" (Iansiti & Levien, 2004), such as Google, Apple, or Facebook. Controlling the core, each of these firms plays a central, orchestrating role within a network of firms and individual innovator–developers that have come to be collectively referred to as the platform's "innovation ecosystem" (Adner & Kapoor, 2010) or "ecologies of complex innovation" (Dougherty & Dunne, 2011).

In the following, we analyze acquisition strategies from the perspective of these platform leaders, that have the possibility to undertake acquisitions to expand based on their dominating position. Most known of acquisitions in digital industries seems to be made by such companies. Examples of acquisitions by companies providing platform complement by platform leaders or other complement providers are, the authors knowledge, few.

For platform leaders, we identify two fundamental acquisition options: platform leaders can choose to expand the platform core (arrow A in Figure 2), by acquire platform leaders in adjacent markets, or to expand into platform complements by acquiring complement providers (arrow B in Figure 2).

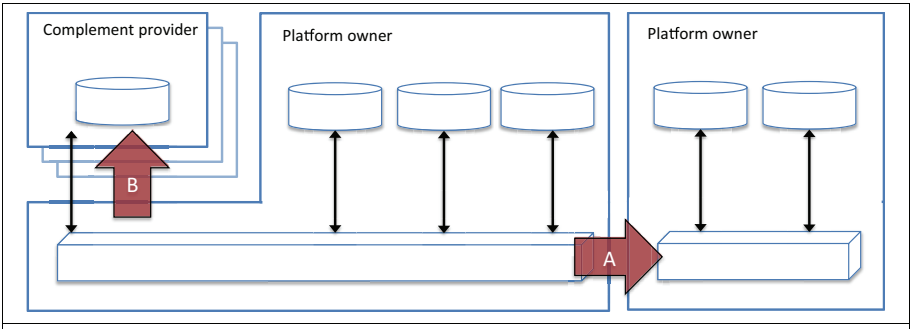

Figure 2. Acquisition types in platform acquisitions

The first type of platform acquisition, platform core acquisition, relates to a strategic move that the platform literature is referred to as an 'platform envelopment' (T. Eisenmann et al., 2011). Platforms in different markets sometimes have overlapping user bases and employ similar components. Envelopment entails entry by one platform provider into another's market by bundling its own platform's functionality with that of the target's so as to leverage shared user relationships and common components.

Two synergistic rationales that can motivate the combinations of two platforms can be found in the literature. Combining the user bases of two platforms can give rise both same-side and indirect network effects. Direct network effects between network users of the same type are characterized as demand-side economies of scale (Katz and Shapiro, 1986; Parker and Van Alstyne, 2005). Indirect network effects constitute demand-side economies of scope. Economies of scope exist when the cost of joint production is less than the cost of producing each output separately (J. Panzar & Willig, 1975; J. C. Panzar & Willig, 1981; Teece, 1980, 1982). As the marginal cost of production in the digital economy is close to zero (Shapiro & Varian, 1999), for the context of platform-based competition, the concept of economies of scope in production has been extended to the concept of economies of scope in innovation, defined as "when the cost of jointly innovating on Product A and B is lower than the cost of innovating on A independently of innovating on B" (Gawer, 2014, p. 4).

Table 1. Platform core acquisition and platform complement acquisitions

Acquisition type	Definition	Value creation	Examples
Platform core acquisition	Acquisition of owners of adjacent platforms, serving overlapping user bases.	Same-side network effects. Economies of scale in innovation (Panzar and Willig, 1975, 1981; Teece, 1980, 1982) Indirect network network effects. Economies of scope in innovation (Gawer, 2014)	Google – YouTube Facebook – WhatsApp Amazon – Audible

Platform complement acquisition	Acquisitions of the platform's complement providers.	Complement monopoly. Pecuniary economies (Porter, 1980; Shepherd, 1979). Innovation complementarity (Bresnahan and Trajtenberg, 1995)	Google – Motorola Facebook – Instagram eBay – PayPal Apple - Siri

Google's acquisition of YouTube is an example of a platform core acquisition. Google initially lunched its Google Video service in 2005 to compete with YouTube. However, as YouTube gained momentum during the summer of 2006, Google decided to buy the company in for US$1.65 billion. Subsequently, Google Video was closed and the content moved to YouTube. This would lead to demand-side economies of scale. Increased direct network effects would be the result of combining the video viewer and video uploader's bases of Google video and YoutTube, respectively. Increased indirect network effects would be the results of combining increasing video viewers with increasing video providers.

The second type of platform acquisition is the platform complement acquisition. Platform owners can assume dual roles in platform ecosystems, acting also as complement providers. Nintendo itself develops and supplies the Super Mario suit of video games. Its usually so that platform owners capture a proportionally larger share of the collective value creation in the ecosystem than do complement providers. However, acquisitions of platform complement providers are still common in practice. We find two economic rationales that can motivate such behavior. The first is the creation of pecuniary economies (Porter, 1980) by establishing a monopolistic position for the complement. Twitter, for example, is a company that is known for (has been accused for) employing such strategies. Twitter had limited success in making profit based on their freely available platform. Instead, third party developers that controlled advertising were the one that captured revenues in the ecosystem. Following, Twitter acquired third party developer Tweetie in 2010, which was by other third party developers considered as a latent death sentence for parts of the Twitter ecosystem. In 2012 then, Twitter launched new rules for the use of their APIs, tilting competition in favor of the their own complements.

However, complement acquisitions do not only capture a larger part of the ecosystem revenues, they can also lead to value creation. This is through innovation complementarity (Bresnahan & Trajtenberg, 1995) in technology. Apple's acquisition of Siri in 2010 is an acquisition that benefited from innovation complementarity. Siri was originally offered as an app in Apple's app store. Siri integrated with other apps, such as OpenTable, Google Maps, MovieTickets and TaxiMagic. Using voice recognition technology, users could make reservations at specific restaurants, buy movie tickets or get a cab by dictating instructions in natural language to Siri. After the acquisition, Apple bundled the app with its iPhone (and later iPad) platform and integrated with all basic functions in the platform including reminders, weather, stocks, messaging, email, calendar, contacts, notes, music, clocks, web browser, and maps. Part of this integration was not possible for third party complements. Hence, as complement offered by the platform owner, Siri could take advantage of increased innovation complementarities.

In summary, because technical integration is a means to realize combination value in acquisitions, it is necessary to distinguish between platform core and platform complement acquisition. The first creates value through increased same-side and indirect network effects, which leads to demand-side economies of scale and innovation economies of scope, respectively. The latter creates value through enabling a monopolistic position for the complement, generating pecuniary economies of imperfect competition as well as innovation complementarities by tighter integration between platform core and complement.

2.2 Product and process integration

A growing body of literature has started to recognize technical integration as a major challenge to value creating acquisitions. The general conclusion of this research is that the principal role technological integration rests in the realization of operational business synergies between the acquirer and the acquisition (G. Toppenberg & Henningsson, 2014; G. N. Toppenberg & Henningsson, 2013). Because companies are from top to bottom dependent on IT in their business processes, synergistic effects do not materialize until the IT resources supporting these processes has been integrated (Tanriverdi & Uysal, 2011; Yetton et al., 2013). Therefore, acquiring companies has to be able to diagnose and implement a mix of IT integration strategies that match the specific synergistic effects searched for in the acquisition.

The literature identifies four IT integration strategies, absorption, co-existence, best-of-breed and renewal, to integrate the acquirer's and acquisition's IT resources. Each strategy realizes a specific acquisition benefit (See Wijnhoven et al. 2006, and Yetton et al. 2013).

In *absorption*, the acquisition's IT resources are retired and replaced by the acquirer's existing IT resources. Data from the target's IT systems are converted and transferred to the acquirer's systems. The assumption is that the acquisition's operations can be supported by the acquirer's IT resources (Johnston & Yetton, 1996; Wijnhoven et al., 2006). The assumption is that the IT cost savings from discontinuing the acquisition's IT support are more then the cost of expanding the acquirer's IT resources to service the additional business from the acquisition.

Co-existence can be partial or full. In the former, some of the acquisition's IT resources are replaced by IT resources from the acquirer, leading to partial standardization with some IT resources shared between the acquirer and acquisition. The acquisition's retained IT resources do not replicate IT resources in the acquirer. In full co-existence, the acquisition's entire IT resources are retained. Where necessary, bridges are built between the acquirer's IT and the IT retained from the acquisition. The assumption is that the expected increased revenues justify the increase in IT and other costs to support the new business.

Best-of-breed involves a conscious selection to be made between the acquirer's and the acquisition's IT-based business processes (Johnston & Yetton, 1996). This strategy is adopted when some of the acquisition's IT-based business processes are considered superior. These business processes are frequently rebuilt on the acquirer's IT platform. The assumption is that some of the IT-based business processes in the acquisition can be implemented corporate wide in the acquirer to improve the acquirer's business processes that are then decommissioned.

In *renewal*, IT resources in both the acquirer and the acquisition are replaced by developing new IT resources. This strategy is adopted when the combined IT resources of the acquirer and the acquisition cannot support the new business strategies and capabilities in the post-acquisition organization. This is the case, for example, when the acquisition is made in order to reposition the acquirer's business strategy from a niche to a scale-based strategy. The assumption is that both the acquirer and the acquisition businesses need to be repositioned to compete effectively in their combined market space.

However, these four IT integration strategies only address the technical integration of the acquirer's and acquisition's business processes. Although platforms market can exist without significant influence from technological ecologies (e.g. shopping malls), platform markets are typically most prominent in industries acting upon 'digital platforms' (Tiwana et al., 2010). Such examples are observed in software development (C. Y. Baldwin & Woodard, 2009; Franke & Hippel, 2003; Gawer & Cusumano, 2008; Morris & Ferguson, 1993), personal computers (Bresnahan & Greenstein, 1999), video game consoles (Zhu & Iansiti, 2012), and smartphones (Tiwana et al., 2010; Yoo, 2010).

From a product consumption perspective, digital platforms can be seen as a particular sort of technological system that is consumed as a whole, rather than through its individual platforms, a phenomenon also known as system-based competition (Katz and Shapiro, 1994). This is because digital products are highly complementary. Complementary products mutually depend on each other and reinforce each other's performance outcomes. Customers prefer to purchase digital products as a system of complements (e.g., office productivity suite as a whole) rather than as stand-alone products (e.g., word processor alone, spreadsheet alone, and presentation package alone) because digital products interoperate. The value of the whole is thus greater than the sum of values of the individual products (Lee et al., 2010).

Because digital technologies are not universally compatible or interoperable, for platform owner's technological decision on the platform design also becomes decisions on how to manage the boundaries of the platform and the innovation ecosystem surrounding it. For example, the design of platform interfaces is a way to govern the openness of the platform. For platform users, the selection of a specific technology is associated with a strategic decision to join a particular platform that operates in a specific technological 'regime' with interoperable technologies (Shane, 2001). Components added to a platform core are "add-on software subsystems" (Tiwana et al., 2010, p. 676) in the form of applications that are designed and developed by third-party developers. For example, an app developer can decide to make the app technically compatible with only Apples iPhone/iPad platform in order to harness the functionality of Apples fingerprint scanner.

Hence, for a firm interested in the development of a complimentary product suit, an essential question of relatedness is if the products of the two companies are, or can be made, interoperable. For WMware the ability to create suits of complementary products, is the key driver for acquisitions:

> *"Through strategic acquisitions, we can expand and enchance our product lines to offer full suites of products that deliver a more dynamic, scalable, integrated and efficient architecture. With less time and money spent integrating, running, and supporting underlying IT infrastructures, customers can focus on efforts that yield greater business and competitive value"*[1]

For WMware, the acquisition implies that the company, rather than the complement provider or the consumer ensure that the platform core and the complement are interoperable. That the platform provider undertakes this role can have notable benefits. Compared to if the task is undertaken by the consumer, the platform provider only has to undertake this integration work once and then it applies to all consumer implementations. Compared to complement developers, the platform owner may have additional access interfaces to the platform. In the acquisition of Siri by Apple introduced above, Apple post acquisition integrated Siri with several functionalities in the platform core that are not open to external developers.

Even though technological product integration have achieved significantly less in the acquisition literature, compared to process integration, based on the literature on system-based competition in digital industries we suspect that product integration should be at pair with process integration in digital platform acquisitions. Table 2 summarizes the two technological integration challenges in digital platform acquisitions.

Table 2. Process integration and product integration

Integration dimension	**Definition**	**Value creation**	**CIOs Role**
Technological process integration	IT enablement of the combined organizations business processes	Operational synergies	Ownership of the technology integration of process and systems for the enterprise
Technological product integration	Interoperability between platform and complement	Offering complementarities	Guide and advise BU leaders on technology product integration as a implementer of technologies

[1] http://www.vmware.se/company/acquisitions#sthash.WikQX6db.dpuf

3 Research method

The research presented in this paper followed an approach similar to analytic induction (Patton, 2002), with the purpose of developing an explanatory theory (see, for example, Gregor, 2006) addressing technological integration challenges in acquisitions in digital industries.

3.1 Case study design and data collection

Our analytic induction approach was based on a positivist case study (Dubé & Paré, 2003; Yin, 1994),. The positivist approach is different from critical or interpretive case study research, where the objective is social critique or understanding the social construction of reality (Klein & Myers, 1999). The case setting supports the examination of how theoretical constructs translate into a new application area (George & Bennett, 2005). The case setting is also suitable for rich exploration of acquisition (Henningsson *et al.*, 2010; Carlsson *et al.*, 2011).

The case in this study, NCS, is a multinational corporation headquartered in the US, with business primarily in networking equipment and related services. Two criteria made NCS an appropriate setting to learn about technology integration in digital platform acquisitions. First, NCS is active in a platform market. For NCS, 'the network', referring to the networking equipment that allows NCS' customers to build out infrastructure to support the company is the platform core. On top of the network, NCS and third party suppliers offers solutions for building services such as streaming video, teleconferencing, and physical security. Second the company's extensive acquisition experiences consisted ample basis from which to learn about technological integration challenges in platform acquisitions. Founded in 1984, the NCS had in 2014 undertaken more than 175 acquisitions.

Access to the case company was achieved through one of the authors of the papers that work in an IT management position within the firm. The author's extensive personal insight into the company was used as background information in the study. Acquisition specific insights were gathered primarily through semi-structured interviews with consenting key informants and a total of 20 informants were interviewed (22 interviews.) Interviews lasted between 60 and 90 minutes. The first interviews were conducted mainly to facilitate face to face (seven out of 10) at the informants' location. Subsequent interviews expanded to the utilization of online collaboration tools (e.g. Skype) making it easier for participants who were geographically distant from the authors or were unable to attend in-person due to other work commitments.

3.2 Data analysis

Consistent with the analytic induction process, data were analysed deductively and inductively. First, following a deductive approach, we analysed the data to identify the different entities in our initiation framework. A priori categories (Saldaña, 2009) representing the acquisition types, value creation mechanism and technical integration challenges were used to code the data.

Second, following an inductive analysis strategy, we revisited the case data to identify relationships between coding categories, and to find general patterns. Coding to discover relationships of relevance was done with selective coding (Strauss & Corbin, 1990). Selective coding refers to 'the process of selecting the core category, systematically relating it to other categories, validating those relationships, and filling in categories that need further refinement and development' (Strauss and Corbin, 1998, p. 116). Based on empirically induced findings and supportive theoretical arguments, propositions were derived. To integrate findings, we developed rich case stories supported by quotes and document references to ensure empirical support for the emerging stories. The rich cases were shared with employees of NSC to get feedback on representativeness of findings.

4 Case: NSC

Much of NSC's growth from a small router manufacturer to a global network business has been achieved through acquisitions. Only a few years after its inception, NSC made its first acquisition. During the following two years another ten firms were added to the organization. By early 2015, the company had completed more than 175 acquisitions, currently acquiring at a pace of 5-10 acquisitions per year. Some of these acquisitions have been directed towards relatively small companies with highly innovative technologies that can be integrated and exploited within existing offerings.

NSC acquirers for several different reasons, there are three specific types of acquisitions that are prevalent however. These are acquisitions done to extend into a new market adjacency (solution extension), acquisitions done to acquire 'tech and talent' which is a strategy to acquire specific engineering groups or a piece of digital technology as a *bolt'on* to existing technology that NSC sells. Lastly, NSC has started to acquire companies that are emerging, investing in a technology that may likely disrupt its own solutions to existing customers. They make these to stay ahead of the technology trends and disrupt themselves and the market leaders they compete against.

With the continued pressures of technological innovation NSC has started to focus the attention of its acquisition strategies more heavily towards the third type identified earlier, the motivation to expand its reach into new market adjacencies and acquire to complement its innovation management efforts. Specifically, the types of acquisitions that NSC is pursuing for acquisition is reflective of its corporate strategy to move away from the reliance on sustainable competitive advantages and towards the idea of transient competitive advantages this allows NSC to continue to move its solution offerings in response to the changing demands of its customers and partners. The acquisition of these types of business units for a digital company like NSC brings about a series of technological integration challenges which NSC must address in order to continue to substantiate value from its acquisitions. In the following two sections we illustrate the technological integration challenges for peripheral and core acquisitions. Each section utilizes a specific acquisition NSC has made in the past 5 years as an example.

The measures of success across all of these types of acquisitions are largely common, focused: Retain 100 percent of the employees who transition from the acquired company, sustain the acquired company's current product and service revenues (as well as current levels of service and support) during and after the transition to NSC and launch new products based on the acquired products and technologies.

To achieve these integration targets, NSC has developed and refined a formalized acquisition approach that encompasses the following elements:

- Formalized and centralized integration management through a designated team in the Business Development group.
- Cross-functional teams that plan, manage, and monitor integration activities across NCS.
- Standard metrics, tools, methods, and processes that can be repeatedly applied to new integration efforts, yet are adaptable to the unique issues and parameters of each deal. These standards are defined both at the corporate level and within the many NSC departments involved in acquisition integration.
- Principles for aligning the acquisition integration work to other major change events, such as divisional consolidations, divestitures, or acquisitions by NSC divisions.

4.1 Technological integration challenges in complement acquisitions

NCS has invested steadily throughout its history on complement acquisitions, though primarily to complement its range of hardware based offerings to its customers. In the past ten years it has shifted its strategy to what practitioners refer to as *tech & talent* acquisitions, where the acquirer is primarily interested a core group of engineering talent and a peripheral technology that fits with a current offering of NCS'. NCS now also makes complement acquisitions of companies that it sees as complimentary to its own products and acquirers them before they have a product on the market and a fully developed business model; this could be seen as a method of incubation through acquisition.

The acquisition of Video Solutions (VS) Group Ltd. illustrates how NCS technically integrate platform complement acquisitions. The acquisition of VS was initiated in 2012 and integration had reached a stable state 18 months after NSC took over the ownership of the unit. At the time the VS acquisition was one of NSC's largest and most complex acquisitions, and brought with it many challenges during the integration phases. VS, a provider of video software and content security solutions, were acquired to extend NSC's current product offerings in video services. The primary motivation for the acquisition of VS' was the desire to accelerate the delivery of its current offerings, a *complement acquisition*.

Given the motivation of the acquisition of VS was to complement an already existing business unit, the product integration was limited to the integration of the technology acquired into the existing technology offerings. The integration challenges faced by NSC were in the integration of the 'go-to-market' portion of the product integration. NCS was challenged with the integration its go-to-market model which was different than the partner and channel model NSC utilizes. The market and product models of NSC and VS very largely separate with slight overlap, therefor the integration of the product and market models were left alone and focus was primarily on the *process integration* (operations, systems and technology). The *process integration* of VS was more significant than the *product integration*. The NCS integration team was faced with several large challenges in the integration of an enterprise level acquisition. A primary challenge was human resources and financial systems integration of VS as they were significantly different than those of NCS. The NCS HR, finance and IT acquisition teams relied on the enterprise architecture of NCS to determine which capabilities was to be the focus of the integration based on their knowledge of the VS architecture. Through the development of a heat-map and an integration roadmap the integration was planned and executed.

The integration of the systems and infrastructure of VS, because of its size and history the company was unlike most NCS had acquired in the past. NCS integration teams used the enterprise architecture team to develop a plan of integration and their reference model to understand the current systems and technology landscapes better. The advantage to this step was to understand which business process VS currently had that was similar to NCS' and what systems and technology capabilities existed that could support them. Following the initial assessment the data centers across VS were powered down and all applications migrated to the NCS environment. Following the initial transfer the IT team then proceeded to identify and remove redundant systems to further seek optimization opportunities. Because the enterprises were very similar there were many opportunities identified.

Based on NCS' experience from the acquisition and integration of platform complement acquisitions we develop two propositions. NCS seems to pay more attention to product than process integration. This is because it's in the product integration that potential difficulties emerge.

P1. Platform component acquisitions are with respect to product integration, concerned with the speed of integration to get the 'time to orderability' of the new modified product to the market.

P2. Platform component acquisitions are with respect to process integration, integrated with an absorption IT integration strategy. The focus is on realizing efficiencies and ensuring that the acquired technology is supported by needed capabilities as it is brought to scale across the platform.

4.2 Technological integration challenges in platform core acquisitions

Core acquisitions have also been part of NCS' acquisition strategy since its inception. In this category NCS primarily targeted large enterprise acquisition opportunities for the purpose of acquiring an existing business unit that would complement its current offerings. The goal was to, through economies of scale, to realize operational efficiencies while building a new market position in an adjacent market. In the past five years however, NCS has increasingly made core acquisitions that tend to be smaller emerging enterprises that are seen as potential disruptors of the current market. These acquisitions are motivated by the opportunity to get a jump start on competitors and other emerging companies in the eco-system and to learn through experience what capabilities are needed to support new business models. For NCS specifically these acquisitions have been in the software and security markets.

The Wireless Management (WM) acquisition illustrates how NCS technically integrates platform complement acquisitions. The acquisition of WM was initiated in late 2012 and reached a stable state of integration 12 months later. At the point of the acquisition WM was a leader in cloud networking, with offerings for midmarket customers in the networking areas of 'easy-to-deploy' and 'on premise' networking solutions. The appeal for NSC was in the opportunity to acquire a new *platform* to extend with *complement* offerings. The acquisition complemented and expanded NSC's intent to move away from primarily hardware-centered offerings towards more software-centric solutions to simplify network management, help customers empower mobile workforces, and generate new revenue opportunities for its partners. NCS was motivated to acquire WM for its market position and its innovative ways of managing an area that NCS was as an adjacent market to its own.

In terms of *process integration*, NCS was interested in the way that the acquired company ran their business, specifically the way they built their products, the way that they designed its service to customers and did product updates was a big change in a way NCS was conducting its business at the time. One specific area of challenge for NCS was the time it took a customer to order the product after the acquisition was completed, at times up to 10x the time it had previously taken. The order process was elongated due to the integration of WM into NCS and the impact was felt by the customers.

For the above reasons the challenges in the offering area were mitigated by leaving WM mostly alone as a stand-alone acquisition at that level. It was important for NCS to protect the key talent in the organization and the projected revenue until it could further learn from its new acquisition and determine which of its *offering* capabilities it wanted to realize synergies through by adopting NCS standards and which capabilities it wanted to reverse integrate. With respect to the *offering integration*, the main challenge was in the sales and supply chain areas. Along with the areas above on orderability the technical integration faced challenges in the process of integrating the systems that supported sales compensation and the manufacturing of the networking equipment along with the software element of the offering. The IT team was faced with several challenges in both areas, the impact of which was the inability for NCS sales teams to fully offer the new offerings to its customers and for the customers to receive their orders.

Based on NCS' experience from the acquisition and integration of platform core acquisitions we develop two propositions. In the case of platform core acquisitions NCS focuses on the process integration heavily, ensuring that the needed enterprise capabilities are put in place to support the continued scaling of the acquisition. This is because the acquired product is likely mature and will be integrated over time.

P3. Platform core acquisitions are with respect to product integration, less of an initial focus since the acquisition likely has a well-established product and the technical integration, unless disruptive, can be done over time and with customer input.

P4. Platform core acquisitions are with respect to process integration, critical to focus on since the acquisition will likely be a newly formed SBU and will need to exist with enterprise grade capabilities to support it.

5 Discussion and conclusions

Through theoretical and empirical analysis we develop four propositions for the technological integration of acquisition in digital industries. These four propositions are based on a distinction between platform core and platform complement acquisitions. The two types of acquisitions create value in different ways. However, both types of acquisitions are dependent on technological process and product integration to realize potential value creation.

Through a case study of NCS we investigate the technological process and product integration challenges in respective type of acquisition. Because technological integration is needed to enable acquisition benefits, the two types of acquisitions are technologically integrated differently. In NCS, platform core acquisitions are with respect to product integration, concerned with the speed of integration to get the 'time to orderability' of the new modified product to the market and with respect to process integration typically integrated with an absorption IT integration strategy. This ensures that the acquired technology is supported by needed capabilities as it is brought to scale across the platform. In NCS, platform core

acquisitions are technology product integration less of an initial focus since the acquisition typically has a well-established product and the technical integration, unless disruptive, can be done over time and with customer input. Instead, in platform core process integration is critical on since the acquisition will likely be a newly formed business unit and will need to exist with enterprise grade capabilities to support it.

Specifically focus in on technological process integration, where a substantive amount of research has been made, we find that in the acquisitions of NCS the technical challenges of process integration emerges primarily on the offering side of the company. This is in contrast to how technological challenges to process integration are conceived in the extant literature, where challenges typically are described as emerging in the operations of the companies. We speculate that this is because platform organizations compete with one single interface towards its customer. As a customer, you buy your iPhone from Apple. Not from Apples mobility division. This integrated customer view creates a greater need for process integration in the customer-interfacing areas of the company, while integration in operations are good to have but not necessary.

5.1 Theoretical and practical contributions

Our research contributes in the intersection of two emerging research streams. One of these streams has focused on research on technological integration challenges in acquisitions. This research has previously addressed technical process integration challenges in industries organized as value chains and value shops. From the viewpoint of this stream of research, digital industries represent an unexplored industry with the potential for new knowledge creation about acquisition challenges, according to Toppenberg and Henningsson (2013).

The other stream of research has focused on strategic management in industries organized as platform markets. In this stream of research scholars have shown increasing interest in how platforms evolve over time (Gawer, 2014) and how companies can enact corporate strategies in platform markets (Boudreau, 2010; T. Eisenmann et al., 2011). From the viewpoint of this stream of research, the prospect for and challenges to acquisitions in platform markets is unexplored ground.

So, in the intersection of these literatures we analyze the technological integration challenges in platform markets. We develop four propositions on the technological integration challenges in such acquisitions, that together advances the understanding of the prospect for an challenges to value creating acquisitions.

This knowledge advancement should be of great value for the many acquiring companies in digital industries. Many of these industries are innovation arms race where technological innovations enable transient advantages that quickly are eroded by new technological innovations. Technological innovation is, however, difficult for mature and rigid companies (Cyert & March, 1963; Kogut & Zander, 1992; Nelson & Winter, 1982; Dierickx & Cool, 1989; Zenger & Lazzarini, 2004). On the other hand, acquiring technological innovation and related capabilities are not easy either.

The findings of this research may help prospective acquirers to better analyze the value potential of technology acquisitions and the technological challenges that may inhibit value creation. The four propositions suggest that different types of acquisition benefits are contingent of different kinds of technological integration. Prospective acquirers should ask themselves what the prospect for dealing with the required process and product integration for a specific acquisition is within their company.

The findings of this research may also assist companies in avoiding problems. As stated by Wijnohoven et al., (2006, p. 25) “the avoidance of problems is of the greatest value to practice.” Research on technological process integration has shown that by preparing the IT resources to be ‘ready to acquire’ the acquirer can avoid many technological process integration problems (Yetton et al., 2013). Our research indicates that for acquirers in digital industries, it is of equal importance to prepare the products for acquisition integration in order to avoid product integration problem.

5.2 Validity, limitations and future research

As with all studies, this research comes with limitations. The main validity threat in the analysis is that it is based on a single case. Single case studies allow for inductive generation of propositions, but do not

enable statistical generalizations beyond the case context. With 175 acquisitions, NCS provided an extensive base of acquisitions to learn about technological challenges from. Yet, all 175 acquisitions were carried out within the context of this single company. We cannot, based on the study here, with certainty about how representative the acquisition behavior is beyond this company. Therefore, the propositions developed here must be considered as indicative findings that need further investigation in a larger sample.

The main limitation of this research is that the analysis focuses exclusively on acquisitions by platform leaders. To the authors' knowledge, there are few examples of acquisitions by platform complement providers. The acquisitions by platform leaders are under researched to motivate a paper. However, subsequent research should seek to extend the knowledge about acquisitions in platform markets to other actors of the platform ecosystem.

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Research Publication IV

Henningsson, S, Toppenberg, G. & Shanks, G. “Sustaining an acquisition-based growth strategy: The use of Enterprise Architecture at Cisco Systems”, under review for Management Information Systems Quarterly Executive (second round)

Sustaining an acquisition-based growth strategy: The use of Enterprise Architecture at Cisco Systems

Abstract

Value creating acquisitions are a major challenge for many firms. Our case study of Cisco Systems shows that an advanced Enterprise Architecture (EA) capability can contribute to the acquisition process through a) preparing the acquirer to become 'acquisition ready', b) identifying resource complementarity, c) directing and governing the integration process, and d) post-acquisition evaluation of the achieved integration and proposing new ways forward. Engaging the EA capability in the acquisition process improves Cisco's ability to rapidly capture value from its acquisitions and to sustain its acquisition-based growth strategy over time.

***Keywords**: Enterprise Architecture, Acquisition, Merger, Integration, Organizational transformation*

1 Introduction

Enterprise Architecture (EA) is a capability that enables organizations to coordinate, execute and sustain business transformation. Business transformation can occur in many ways, including restructuring and acquisitions. This paper explains how Cisco Systems, a multinational corporation headquartered in San Jose, California, with business primarily in networking equipment and related services, engage its EA capability in its growth by acquisition-strategy[1]. The engagement of EA contributes to Cisco's ability to capture value from its acquisitions and to sustain its acquisition-based growth strategy over time.

Acquisitions of other businesses continue to be popular alternatives for corporate strategy. Appropriately executed, acquisitions can enable business benefits of scale and scope, give access to unique resources and induce strategic renewal. The act of acquisition is, however, far from simple.

[1] With 'acquisition' we refer to the ideal type organizational transaction of one larger acquirer taking ownership of one smaller acquisition target. Typically in these acquisitions, the acquirer decides on and drives the acquisition process. Although EA may have an equally important role to fill in the more equal organizational combination of mergers, we do not analyze EA with respect to that type of organizational transaction in this article.

Typically acquisitions do not create financial value for the acquirer[2]. Either the potential recombination synergies are over-estimated in the pre-acquisition evaluation of the target, or the acquirer never succeeds in realizing potential synergistic effects in post-acquisition integration.

In addition, for firms with acquisitions as part of their growth strategy, efforts to reap short-term, direct benefits from the acquisition have to be balanced with the long-term need for a sustainable growth strategy. Acquiring companies are typically forced to put their acquisition programs on hold after a few acquisitions to undertake major organizational restructuring[3]. This is because frequently, acquisition integration introduces organizational inefficiencies that accumulate across a series of acquisitions. For example, following acquisitions an organization may have an increasingly complex information technology (IT) infrastructure that inhibits organizational agility[4]. Thus, firms with acquisitions as part of their growth strategy have to balance the need to quickly substantiate direct acquisition benefits, with the long term need to avoid accumulating organizational inefficiencies to sustain the growth strategy.

For Cisco, acquisitions form an integrated component of the corporate strategy. Founded in 1984, Cisco had in 2013 grown to 74,000 employees and revenues of $49 bn. Much of this growth has been achieved through acquisition and integration of 179 business units. To do so, Cisco has developed an acquisition capability that has given it the reputation of an acquirer that repeatedly identifies and captures value through its acquisition process. However, in both the mid 1990's and 2000's[5], accumulating inefficiencies forced Cisco to undertake major restructuring to unlock the full potential of its rapidly achieved growth. Therefore, today Cisco's acquisition process balances capturing short-term value from its acquisitions with the long-term sustainability of its growth strategy. According to Cisco's CEO John Chambers:

> "I think we have shown an unbelievable ability to reinvent ourselves and Cisco will be an aggressive buyer of software companies over time … Cisco's shareholders are comfortable with us being more aggressive in making acquisitions, given Cisco's recent record of holding down expenses."[6]

To achieve acquisition integration that does not compromise sustainability of the growth strategy, Cisco increasingly draws in its EA capability in the acquisition process. At Cisco, the EA capability

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[2] Haleblian, J., et al., *Taking stock of what we know about mergers and acquisitions: A review and research agenda.* Journal of Management, 2009. **35**(3): p. 469.

[3] Barkema, H.G. & Schijven, M.P.G. (2008). Towards unlocking the full potential of acquisitions: The role of organizational restructuring. *Academy of Management Journal, 51*(4), 696-722

[4] Henningsson, S. & Yetton, P. (2013) Post-acquisition IT Integration: The sequential effects in serial acquisitions. EURAM 2013

[5] See, Austin et al. (2002) Cisco Systems, Inc.: Implementing ERP and Cisco (2007) How Cisco IT Upgraded Its ERP Manufacturing and Finance Modules. Cisco IT Case Study

[6] http://www.bloomberg.com/news/articles/2015-02-19/cisco-ceo-says-company-will-be-aggressive-acquirer-over-time

contributed to the *pre-acquisition preparation* of the firm to be 'acquisition ready', to the target *selection* by showcasing resource complementarity, to acquisition *integration* by directing efforts towards desirable target states, and to *post-integration management* by guiding corrective action to ensure the success of the long-term growth strategy.

This paper proceeds as follows. We first present a generic phase model of corporate acquisition to identify the issues in the acquisition process that an EA capability can help to mitigate. Following that, we describe how Cisco uses its EA capability in each of the acquisition model phases and explain how Cisco achieves this through engaging EA in two different ways: *Directly* in the acquisition process by performing specific tasks in the acquisition project, and *indirectly* by delivering resources (EA artifacts such as capability maps and reference models) that are used in tasks within the acquisition project. We conclude by providing five lessons to assist organizations in engaging EA in the acquisition process.

2 The acquisition challenge

The acquisition challenge can be decomposed into four interdependent phases[7] (Figure 1). First, the acquisition process starts well before a potential target has been identified by making the acquirer 'ready to acquire'[8]. *Pre-acquisition preparation* takes place over a period of time that is measured in years. During this period management builds the resources needed, such as a flexible IT platform that can accommodate new businesses, to manage acquisitions and develops top management's trust in those resources.

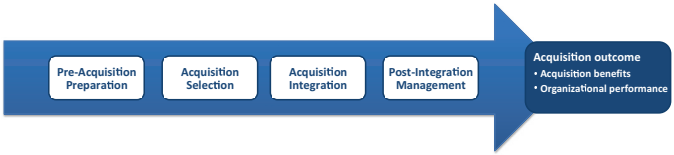

Figure 1. The acquisition process

Second, the acquirer must select the right target to acquire. The *selection* phase comprises the identification of threats from and opportunities for post-acquisition resource combinations, and to estimate their potential value. Frequently, acquisitions are motivated by a number of different

[7] See, e.g. Barkema, H.G. & Schijven, M.P.G. (2008). Towards unlocking the full potential of acquisitions: The role of organizational restructuring. *Academy of Management Journal, 51*(4), 696-722

[8] Yetton et al. (2013). "Ready to Acquire": The IT Resources Required for a Growth-by-Acquisition Business Strategy.

business benefits that together should offset the premium paid by the acquirer for control over the target. This requires a deep understanding of the acquirer's own resources, as well as the ability to assess the acquisition's stock of resources.

Third, the acquirer must accomplish appropriate *integration* of the target. This entails diagnosis and implementation of the integration mechanisms that substantiate acquisition benefits; benefits of scale, scope, resource addition and strategic renewal are all dependent on different integration mechanisms. In addition, the acquirer must limit the integration's potentially negative impact on the acquirer's overall performance. Frequently, acquisition integration is solved suboptimally, introducing organizational inefficiencies, such as increased complexity and reduced business and IT alignment. Suboptimal solutions may be both deliberate and necessary in the short-term, but will, if not corrected, have a long-term negative impact on the acquirer.

Therefore, fourth, in *post-integration management*, the acquirer must address the organizational inefficiencies created in the integration. Achieving acquisition benefits without compromising firm performance is of particular importance for the many 'serial acquirers' that make several acquisitions per year, as inefficiencies would rapidly accumulate and threaten the firms' growth strategies.

Within this generic acquisition process, a specific acquisition can take several distinct paths. The literature typically point to *absorption*, *preservation*, *symbiosis* and *renewal* as generic acquisition strategies[9] (see Table 1). Therefore, depending on the outcome of one phase the activities in the next phase might be very different. For example, if in the selection phase an opportunity for an absorption acquisition is identified, the integration of such acquisition will require fundamentally different tasks to be completed, compared to when an opportunity for a symbiosis acquisition is identified. In a preservation acquisition, very little integration work will be required. However, most large acquisitions present a number of distinct acquisition benefits, and therefore progress through the phases of the acquisition process through parallel workstreams seeking to leverage each benefit[10].

[9] Haspeslagh, C. and B. Jemison, Managing acquisitions. Creating value through corporate renewal. 1991, New York, Ny: The Free Press.

[10] Henningsson, S. and S.A. Carlsson, *The DySIIM model for managing IS integration in mergers and acquisitions*. Information Systems Journal, 2011. **21**(5): p. 441-476.

Table 1. Generic acquisition strategies	
Absorption	The target company is completely absorbed by the acquirer to form one new entity in which the target company ceases to exist. Such acquisitions are made to achieve benefits of scale and to increase market share. The main synergy benefit is cost reduction.
Preservation	In this strategy, the capabilities of the acquired company are nurtured and maintained in order to allow them to further exploit and develop their capabilities from which the acquirer can benefit. Here, the benefits of the acquisition are based on the strengths of the target company that should be preserved. As the target remain autonomous, no or very little integration occurs.
Symbiosis	A strategy in which synergy is created by combining only the strengths of both parties. Scope advantages are possible since complementing capabilities are obtained to enhance the resulting company's combined offering. In this strategy, the processes in each company that contribute to the strategic purpose of the merger are left intact and those that are similar are combined to reduce redundancy.
Renewal	In this strategy, the acquisition is made to reposition the acquirer in the marketplace. This can, for example, be made by combining the volumes of two niche companies to reposition them in the low-cost segment of the market. Renewal acquisition means that a new business model and the capabilities to deliver this model is re-invented.

3 Enterprise Architecture at Cisco

Macroeconomic trends of globalization, information digitization, broadband proliferation and the consumerization of IT, have caused enterprises all over the globe to reinvent their business models to take advantage of these trends and gain competitive advantage. These business trends have resulted in the adoption of digital technologies, evident across industries. The scale and complexity of such technology adoption is large, impacting crucial aspects of enterprises including target markets, offerings, pricing methods, customers, channel partners, suppliers and the workforce. Changes in the business affect various aspects of operations: operational scenarios, business processes, policies and important business metrics. All these changes, in turn, have an impact on the systems that are used to automate business operations. Often changes in the company's technology infrastructure are needed to achieve the desired shifts in business model and operations.

In order to manage these enterprise transformations, many companies turn to EA. EA is "the organizing logic for business process and IT capabilities reflecting the integration and

standardization requirements of the firm's operating model."[11] A functional EA capability ensures maintained alignment between business and IT strategy[12]. EA has three primary purposes: providing a blueprint for the current state of the organization (*description purpose*), the desired target state (*design purpose*) and the roadmap for achieving and evaluating the target state (*assessment purpose*)[13].

EA at Cisco was until the late 2000's focused on the activities surrounding technology planning. EA provided a way for IT architects and leaders to align technology enablement to the continuously complex business models that were being maintained. However, given the accelerated pace of change in the technology industry and the growing number of acquisitions Cisco made it was unable to sustain this pace without a more elaborated approach to alignment of business and technical architectures. Consequently, in 2007 Cisco started to explore the possibilities and benefits of a corporate EA capability that included both business and technical architecture and aimed to help planning for business transformation at the enterprise scale. Since 2007, the objective of the EA capability is to coordinate ongoing business and technological transformation. Cisco is an organization where change is constantly high and business and technology dimensions of the company needs to co-evolve to retain alignment. Cisco uses the term 'architecture-led planning' to denote a discipline of strategically aligning the technical portfolio and investment decisions, simplified processes, resource and system optimization to capture business transformational value.

Cisco's EA capability builds on the BOST architectural framework and includes Business, Operations, System, and Technology views, supported by a reference architecture (Figure 2). The BOST framework is a generic EA framework developed by Informatica (formerly Proact) that is provided with a set of industry-specific reference models as a starting point for companies to develop their specific reference architectures[14]. Among available frameworks, the BOST framework was chosen because it was considered best suited for the new emphasis on business architecture. In addition, Cisco was the first adopter of the reference model for high-technology industries, and had the possibility to influence the development of the high-technology reference model.

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[11] Ross, J.W., P. Weill, and D. Robertson, *Enterprise architecture as strategy: Creating a foundation for business execution*. 2006: Harvard Business Press, p. 9.

[12] J. A. Zachman (1997), "Enterprise architecture: The issue of the century," Database Programming and Design, 1997

[13] Stelzer, D. (2009), "Enterprise Architecture Principles: Literature Review and Research Directions", 4th Workshop on Trends in Enterprise Architecture Research (TEAR), November 23rd, 2009, Stockholm, Sweden

[14] https://www.informatica.com/content/dam/informatica-com/global/amer/us/collateral/white-paper/Introduction-to-BOST-Framework-Reference-Models-whitepaper_2753.pdf

The four views of the BOST framework represent different layers within an enterprise, and there are five different types of models within each view:

- The *Business* view is focused on the market, and includes the product, market and resource models. This is where Cisco identifies what products are part of its portfolio, what markets it serves and the resources needed to accomplish its mission.
- The *Operations* view includes models that describe operations processes such as supply chain, financial reporting, human resources and organizational models.
- The *Systems* view includes the application relationship models and the information exchange diagrams that show how data is transacted between systems.
- The *Technology* view includes the technological infrastructure models, including device and network models.

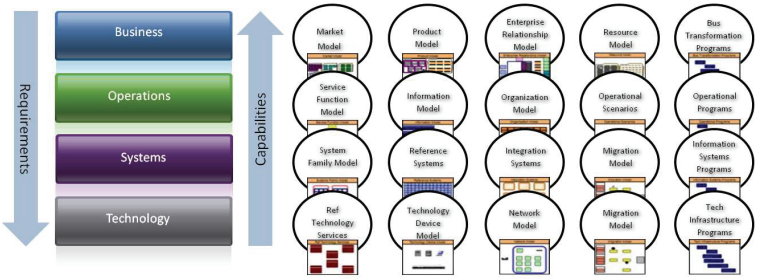

Figure 2. Cisco's EA Framework, as a specific of development based on the generic BOST framework.

EA is structurally positioned as a cross-functional capability, sitting between business and IT functions (see Figure 3). In 2015, the total headcount in the EA team was about 100, divided into 70 people working in various roles related to systems and technology architecture and 30 people employed to manage business and operations architecture. The head of business architecture reports to the COO and is responsible for the business and operations view of the architecture. The head of technology architecture reports to the CIO and is responsible for the systems and technology views. The business and technology side of the EA capability is coupled through the link between basic service functions architects and chief architects that typically work in pairs with one stack of capabilities ranging from business to technological enablement. For example, one pair of architects at this level has responsibility of Cisco's software consumptions models. That is, the four ways Cisco is offering software to its customers are considered business capabilities. Managing changes

related to these capabilities and the enabling stack of operational, systems and technology capabilities is the responsibility of one EA pair.

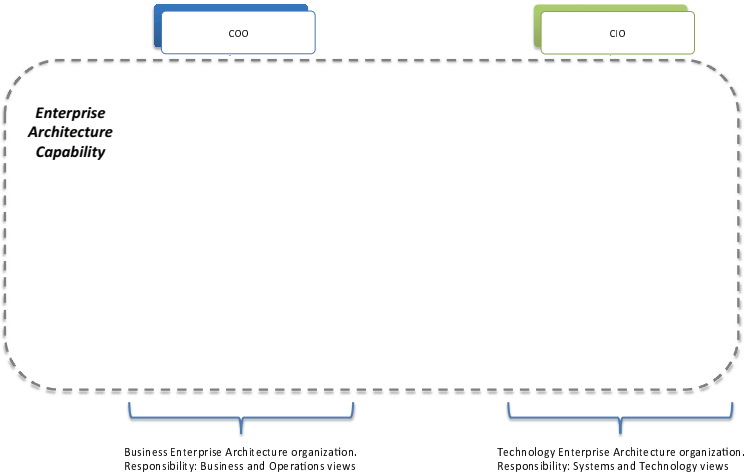

Figure 3. Structure and placement of the EA function at Cisco.

This emphasis on EA as an approach to think about business strategy sets Cisco apart from many other organizations. The BOST framework was adopted because it was rooted in the business (B) view of the architecture. Therefore, it enables Cisco's leaders to communicate their desired target state for the market, product and other business model elements with the required level of detail. Capability maps has become a way for business managers to communicate business visions and to-be scenarios. Based on the target state in the business view, the operations, systems and technology views are developed to depict the desired transformations at the enterprise level. Also relatively unique to Cisco is the EA methodology that describes how the reference model that supports the framework is updated. Architects follow elaborate routines to identify where in the enterprise reference model there is a need for transformation, what the current state of the enterprise is, and to document, based on the corporate strategy, the desired target state. This ensures that information is captured and available for future use. The model repositories serve the role of 'a single source of truth' for Cisco's EA and can also be used to educate new employees, consultants, and partners.

4 Using EA at Cisco's to drive the acquisition process

Much of Cisco's growth from a small router manufacturer to a global network business has been achieved through acquisitions. Seven years after its inception, Cisco made its first acquisition. During the following two years another ten firms were added to the organization. By mid 2015, the company had completed 179 acquisitions[15], continuing to acquire at a pace of 5-10 acquisitions per year. Some of these acquisitions have been directed towards relatively small companies with highly innovative technologies that can be integrated and exploited within existing Cisco offerings. Other larger acquisitions, including Scientific-Atlanta ($6.9 bn), WebEx ($3.2 bn), Tandberg ($3.3 bn) and NDS Group ($5.0 bn), have offered complete businesses in areas complementing Cisco's existing businesses or provided radically new ways of competing in areas where Cisco already had a large presence. Acquisition strategy

Cisco rarely does pure absorption acquisitions to achieve scale in business or renewal acquisitions with the aim to reposition Cisco's corporate strategy. Instead, Cisco typically acquire to gain access to complimentary products or innovative technologies and associated capabilities. Cisco's CEO, John Chambers, is adament about the role of acquisition integration to drive growth in the company:

> "Instead of an R&D budget, at Cisco we buy the technology we need to grow and expand into new markets." [16]

This is typical for the high-tech industries, where much of the value of the acquisition resides in the unique capabilities of the target – in contrast to "fire sales" of distressed companies with the objective is to obtain market access, customer stock, production capacity or other assets,[17]. In consequence, Cisco's acquisitions commonly include an element of symbiosis and/or preservation. However, also these acquisitions have a dimension of absorption, where the target's business capabilities are migrated to Cisco's technological capabilities. Therefore, most of Cisco's acquisitions typically represent a mix of acquisition benefits, which are captured with a corresponding mix of acquisition strategies.

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[15] http://www.cisco.com/web/about/doing_business/corporate_development/acquisitions/ac_year/about_cisco_acquisition_years_list.html

[16] http://www.businessinsider.com/cisco-john-chambers-acquisition-strategy-2014-7

[17] Graebner, M.E., *Momentum and serendipity: How acquired leaders create value in the integration of technology firms.* Strategic Management Journal, 2004. **25**(8): p. 751-777.

The overarching rule for making an acquisition at Cisco is that the target should be performing better as part of Cisco than under its pre-acquisition ownership. Besides unit profit, the indicator that is considered best representing financial performance is "Free cash flow", calculated as operating cash flow minus capital expenditures. Free cash flow represents the cash that a company is able to generate after laying out the money required to maintain or expand its asset base. Free cash flow is important because it allows a company to pursue opportunities that enhance shareholder value. For small acquisitions that are assimilated into Cisco and cease to exist as independent profit center, profit and free cash flow is calculated for the combined unit.

Financial performance measures are, however, subject to market fluctuations and the influence of external factors. Therefor, Cisco has identified three success criteria that are used to evaluate the acquisition as such. These acquisition performance measures are used to evaluate the acquisition team, that might do a good job despite a market downturn impacting general financial performance. These are: retain 100 percent of the employees who transition from the acquired company; sustain the acquired company's current product and service revenues (as well as current levels of service and support) during and after the transition to Cisco; and launch new products based on the acquired products and technologies.

Particular performance measures are further specified for the integration phase of the acquisition process. These are measured in addition to the overall success of the acquisition and are appraised by three criteria that are applied across the integration (in relative order of importance):

1. **Time to orderability**: The time from day one of the acquisition until the offerings of the acquired companies are included in the integrated Cisco offering.
2. **Time to completion**: The time from day one of the acquisition until the desirable level of integration has been achieved.
3. **Cost Savings**: The total amount of cost synergies that can be realized.

To achieve these targets, Cisco has established a centralized acquisition capability that address all acquisitions with the same high-level acquisition approach that encompasses the following elements[18]:

- Formalized and centralized integration management through a designated team in the Cisco Business Development group.

[18] For further details on Cisco's integration strategy see Cisco white paper "How Cisco Applies Companywide Expertise for Integrating Acquired Companies "

- Cross-functional teams that plan, manage, and monitor integration activities across Cisco.
- Standard metrics, tools, methods, and processes that can be repeatedly applied to new integration efforts, yet are adaptable to the unique issues and parameters of each deal. These standards are defined both at the corporate level and within the many Cisco departments involved in acquisition integration.
- Principles for aligning the acquisition integration work to other major change events, such as divisional consolidations, divestitures, or acquisitions by Cisco divisions.

4.1 EA in the acquisition process

Since the revitalization of the EA function in 2007, EA has gained increasing importance as a tool for managing the specific organizational transformation process of acquisition. Initially, EA assisted the cross-functional teams by providing requested documentation of Cisco's capability landscape. More recently, EA has also been included in the acquisition team to carry out specific tasks in the acquisition process. Looking across the acquisitions Cisco have made, EA has been extensively involved in all for phases of the acquisition process. Four EA artifacts assume particularly prominent positions in the acquisition process: the enterprise reference model, capability heat maps, capability roadmaps and the EA health metrics dashboard. How these tools are used is explained in Boxes 1-4.

- In the *pre-acquisition preparation phase* that is general and not specific to any acquisition, EA contributes to maintain Cisco 'acquisition ready'. The key EA artifact in this activity is the enterprise reference model that is used to ensure the integrity of the architecture and serves a key role in capturing the evolving as-is state. Maintaining Cisco acquisition ready, enables Cisco to hit the ground running in any business transformation, avoiding the need to first prepare critical resources or to document the as-is scenario.

EA contributes to maintaining Cisco acquisition ready through three different activities: infrastructure preparation, documentation and knowledge integration (see Table 2). *Infrastructure preparation* is ensured by constantly monitoring the integrity of the infrastructure. When IT components are introduced into the systems or technology level of the EA framework, these components are assessed for their connectivity, their level of conformity with Cisco standards and possible integration scenarios. Ensuring the infrastructural integrity allows for relatively effortless extension and expansion of the existing IT infrastructure. *Documentation* is ensured by maintaining the enterprise reference model as the single source of truth (see Box 1). This way, the acquisition team can focus solely on the target in a potential acquisition situation. Creating the documentation when an acquisition target is identified would severely delay the process of assessing the match between the two organizations or significantly increase incorrect assumptions about capabilities.

Knowledge integration is a consequence of the work in interdisciplinary teams within EA that enable individuals to develop a better understanding of the existing opportunities and constraints for both sides of business and technology. Each partner in the EA team is constantly getting a better understanding of the implications decisions taken have for the other partner, and the possibilities the partner have to respond to demands.

Box 1. The enterprise reference model

The enterprise reference model is a critical component of what makes Cisco's current EA effort distinctly different from previous efforts. The reference model captures the current state of doing business for Cisco and shows how the components in the business, operations, systems and technology views are currently working together to enable Cisco to do business. The enterprise architects utilize the models captured in the reference model in their interviews with business and technology leaders interested in transforming the current state of the business. This can be due to a needed restructure, acquisition integration, the move out of certain business models or a divestiture.

Table 2. Cisco's use of its Enterprise Architecture capability in acquisitions

Engagement	**Activity description**
Pre-acquisition preparation	
1a - Infrastructure preparation	*Ongoing control activities to ensure that no transformational or development activities compromised the IT infrastructure flexibility*
1b – Documentation	*Ongoing documentation of the organization, including, appropriate resource and organizational models (figure 1)*
1c – Knowledge integration	*Working closely in joint teams with business and technology partners, the EA function promotes an ongoing awareness of the possibilities and constraints of the other partner*
Selection	
2a - Business case estimation	*Valuation of combinatory potential*
2b – Roadblock analysis	*Analysis of roadblocks that could hinder synergy realization*
2c – Transformation need assessment	*Cost estimation for the transformation needed to leverage potential synergistic effects*
2d – Reversed integration potential	*Investigation of the possibilities to redeploy capabilities from the acquisition in Cisco*
2e - Suite analysis	*Product/Service/Solution offering overlap and analysis*
Integration	
3a - To be state definition	*Identification of 'integration debt' for specific solutions, development of operational scenarios and target state for business, operations, systems and technology views*
3b - Organizational design	*Alignment of acquired entity's resource models and organizational models*
3c - IT enablement	*Site and Infrastructure Technology enablement*
3d – Roadmap development	*Capability integration roadmap, migration model development*

Post-integration management	
4a – Integration evaluation	*Providing metrics for integration performance evaluation*
4b - Integration correction	*Corrections to ensure that platform integrity was restored*

- In the *selection phase*, EA contributes to the target selection by showcasing resource complementarity between Cisco and the target. Understanding the complementarities is fundamental for estimating synergistic effects accurately and the barriers that need to be overcome to substantiate acquisition benefits.

Specifically for the selection phase, EA is engaged in five distinct activities: business case estimation, to-be state definition, transformation needs assessment, roadblock analysis, and discovery of reversed integration potential. *Business case estimation* takes the as-is description of Cisco as one of its starting points. The other starting point is a set of assumptions about the target's capabilities. In some cases, little possibility exists to verify assumption due to legal or strategic restrictions. In other cases, information is available to verify these assumptions during the due diligence in the selection phase. Regardless of which, the process continues with the *transformation need assessment*, the EA team carries out an assessment of the costs associated with implementing the needed business and technology transformations to integrate the two organizations. Associated with this activity EA also contributes to the *analysis of major roadblocks* that could hinder the expected synergistic effects, for example differences in how services and products are offered to a market. In addition, EA also has the responsibility to investigate if there are advanced capabilities in target that were worth redeploying in Cisco through r*eversed integration*. Finally, given its unique understanding of how technological and organizational resources can be bundled, the EA team had the responsibility to ensure that the target's IT-based offering can be integrated and co-exist with Cisco's existing suite of products (*Suite analysis*). This is because Cisco is itself always the first implementer of Cisco's own products, and the EA function is responsible for the implementation. If Cisco itself expected problems and/or limited benefits, the typical customer of Cisco can be expected to experience the same issues.

All of these activities in the selection phase are based on the initial assumptions of what the capabilities of the target can be expected to look like, based on what is known. Members from EA and from the acquisition team are constantly working to verify or redefine these assumptions. To do so, the capability heatmaps are important tools (see Box 2). The capability heatmaps convey where the critical capabilities for the acquisition can be found. Therefore, it is in the areas covered by the heatmaps where assumptions have to be carefully investigated, if possible. Sometimes, assumptions can only be validated after the deal has come into effect, when it is too late to reverse it.

Box 2. Capability heatmaps

The Cisco EA team utilizes capability heatmaps to determine what capabilities currently exist in the enterprise and what capabilities are being acquired. They use this information to determine if Cisco has the required capabilities to sustain and support the acquired company at scale once fully integrated. Furthermore, the heatmaps are used to determine if there are capabilities in the acquired entity that are suitable for *reverse integration.* This is prevalent in the acquisitions of disruptive innovations.

- In the *integration phase* the acquirer consolidates the two organizations to substantiate the expected business benefits from the acquisition. In this phase, EA contributes by directing and governing the transition towards a desirable end state that realized the acquisition benefits without compromising long term performance.

EA contributes to four tasks in the integration phase: to-be state definition, organizational design, IT enablement, and roadmap development. The first activity after the deal has come into effect is to define the to-be state to reach in the integration. At this stage, the assumptions of the high-level planning during the selection phase are re-assessed. The outcome of this activity is a detailed capability model of the envisioned organization. Following the To-Be state definition, EA contributed organizational design, in which it is decided how the acquired workforce should be distributed in the Cisco organization. The acquisition team, utilize the organizational capability models provided by EA to determine the conceptual integration of the workforce into the Cisco workforce model. The EA team also provide input to how the organizational design can be supported efficiently by technological resources, the *IT enablement* of the organizational design. The technology models contained in the reference model are used to determine the needed transformation to support the systems and operational capabilities required. Finally, the EA team is engaged in the capability *roadmap development*, including a migration model that would realize the desired To-Be state. The EA team leverage a capability integration roadmap showing the capabilities to map systems and technologies and determine the relative difficulty of integration and the options to consider along with a cost estimate (see Box 3). The roadmap takes into account other ongoing transformations in each capability view. The integration activities are therefore not separate and unique transformation activities but are built into the general capability roadmaps for each part of the EA.

Box 3. Capability roadmaps

Capability roadmaps (see Figure 4) are used at different points in the acquisition integration process. In pre-acquisition enterprise leaders worked with architects to determine the current state of Cisco's business utilizing the reference model and any ongoing or planned transformation efforts that may trigger an interdependency with the acquisition integration or potentially a gap that is needed to fill to support a new business model or business unit. During acquisition planning the architects use the capability roadmaps to show how the acquisition integration of a target is integrated into the ongoing transformation efforts across the four views in the BOST framework. Lastly, during post-acquisition management the EA team can use the capability roadmaps to determine the level of success of the integration.

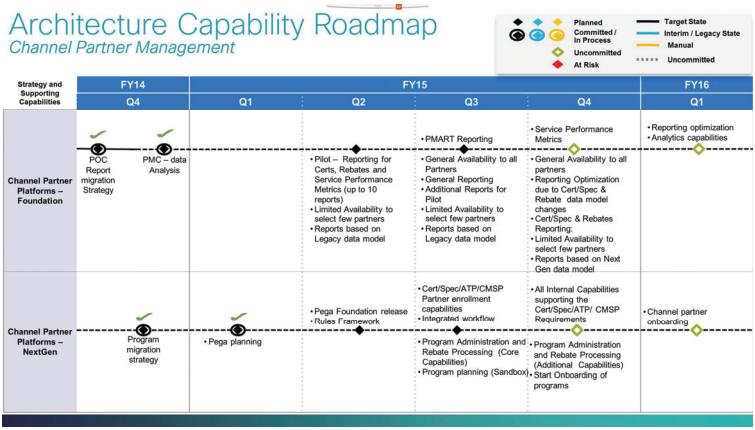

Figure 3. Example of Cisco IT Capability Roadmap

- In the *post-acquisition management phase*, EA is primarily engaged in reflection on the business and technical integration achieved to learn and to take corrective action when needed. Here, EA's qualities for an assessment purpose are utilized.

During the post-acquisition management phase, EA is engaged in two specific activities: integration evaluation and integration correction. To be able to learn and continuously improve in the acquisition capability, Cisco conducts a comprehensive *integration evaluation* to determine how the integration proceeded in the acquisition. The digital traces from EA in terms of integration roadmap

and target state at the business, operating and technical levels are used by the acquisition team to measure the integration against the three integration key metrics, 1) Time to orderability, 2) Time to completion, and 3) Cost Savings. EA is not contributing to the evaluation of the general acquisition metrics. The second activity that EA contributes to in the post-acquisition management phase is the integration correction. This implies restoring of 'integration debt' intentionally or unintentionally created during the integration project. To do so, the EA health metrics dashboard is a critical tool (Box 4). The dashboard conveys deviations from Cisco's ideal architecture. Corrections are worked into the capability roadmaps for the coming 18 months to ensure that whenever a new opportunity to acquire emerges, Cisco is always ready to acquire.

Box 4. Enterprise Architecture Health Metrics Dashboard

The EA health metrics dashboard (see Figure 4) is the tool the executive team at Cisco uses to assess the ongoing health of the EA. The dashboards are presented in the form of EA portfolios, fourteen in total. Each is measured in terms of architecture health in the following four areas: Risk, Policy, Maturity and Interdependence. Each EA portfolio includes the needed integration activities to complete the integration of acquisitions in addition to other ongoing transformation activities in the organization. This enables the executive leadership team to see the full scope of transformation within the enterprise rather than a siloed view of the integration activities separately from other transformational activities. With this tool the executives can determine how the integrated components of acquisitions are being dealt with beyond the integration life-cycle and the integration success can be measured based using these metrics in addition to those earlier discussed.

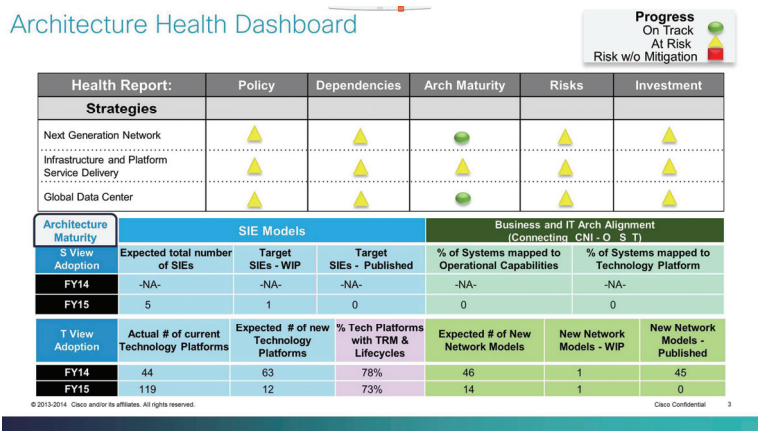

Figure 4. Example of Cisco IT Architecture Health Dashboard

5 EA in practice: The Video Solutions acquisition

The involvement of EA in a given acquisition is dependent on the acquisition characteristics, including the need for integration. Below, we illustrate how the EA function contributes to the acquisition process through the specific acquisition of Video Solutions (VS) Group Ltd. On March 15, 2012, Cisco announced a definitive agreement to acquire VS, a provider of video software and content security solutions (see Figure 5). The primary motivation for the acquisition of VS' was the desire to rapidly extend Cisco's current product offerings in video services. VS' major product was the VideoGuard conditional access system, which was used by more than 85 pay TV operators around the world. VideoGuard was designed to help TV operators to seamlessly extend their pay-TV services to connected media devices, enabling secure ingestion, delivery and consumption of premium content. VS' software, customer segments and services model complement Cisco's networked video offerings and accelerate the delivery of Videoscape, Cisco's offering that enables service providers and media companies to deliver streaming video. A secondary motivation was to stretch the Videoscape platform's reach in the service provider market into China and India, where VS has an established customer footprint. The integration of VS had reached a stable state towards the end of 2014.

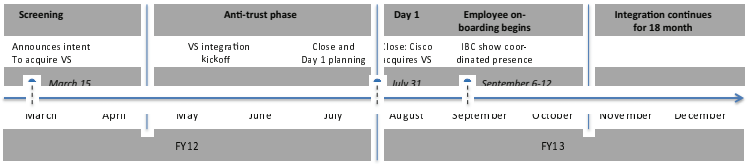

Figure 5. Timeline for VS acquisition

Strategically, VS represented a combination of strategies, including absorption, preservation and symbiosis. Overall, Cisco wanted to absorb VS into its video services business area. However, unique capabilities related to the development of VideoGuard were to be preserved and other capabilities related to how VS interacted with customers consisted potential for introducing innovative practices into other parts of Cisco. Consequently, integration followed a mix of integration approaches, including migration of VS business capabilities to Cisco technical capabilities, retention of unique VS business capabilities, and even reversed integration, where Cisco redeployed new practices throughout Cisco.

VS, being one of Cisco's largest and most complex acquisitions, illustrate many of the potential applications of EA capability to contribute towards acquisition value. In other acquisitions by Cisco, the use of the EA capability has been a sub-set of this potential. For example, in the acquisition of Meraki, the decision was taken to retain Meraki as a largely independent unit. Therefore, very limited integration was needed, which naturally implied that the use of EA was limited to updating the enterprise reference model with the acquired capabilities. The VS acquisition, however, drew extensively on EA throughout the acquisition process. A description of the EA use in the VS acquisition is provided in Table 3 and discussed below.

The benefits of using EA in the pre-acquisition phase can be detailed by Cisco's work in software consumption models. In 2007, depending on which part of Cisco the customer were interacting with, the customer was offered a unique set of options for buying software from Cisco. In total, Cisco was offering software to their costumers in 32 different ways. However, at this stage no one at Cisco knew that the company had exactly 32 different consumption models, or what the models were, since there was no repository providing such information. The different consumption models were results of Cisco's extensive acquisition program. Each time a new acquisition was made, a new way of selling software was bolted on to the existing set of consumption models. The business manager would ask Cisco's IT function to supply system and technical capabilities to support the new consumption model. The technically oriented EA function tried to mobilize pre-existing IT

solutions, but with the multitude of business practices the complexity of technical infrastructure grew fast. In addition, oftentimes, Cisco's IT department were not involved at all in enabling the consumption models. Necessary capabilities could be sourced through Cisco Services, or kept locally in IT departments run by the business units themselves. Similar developments were taking place in other areas, not just in relation to consumption models. Because of the growing complexity of the business and technical practice, leveraging synergistic effects from new acquisitions grew increasingly difficult and, even more important, Cisco costumers grew increasingly unhappy with the fragmented presence of Cisco.

Following the repositioning of the EA with a starting point in business architecture and the adoption of the BOST framework in 2007, Cisco decided to standardize on four consumption models: own up front, lease, software as a service and utility. Underneath the four consumption models, specified as business capabilities, were sets of standardized operational, systems and technology capabilities to support the business capabilities. Furthermore, EA was given the task and authority to make sure that these four models of consuming software remained the only models. For acquisitions, this meant that every future acquisition should fit into that architecture.

Consequently, when VS was surveyed for acquisition in 2012, Cisco offered four standardized consumption models, which were easy to redeploy in different context and that were well documented in the enterprise reference model. With the relevant Cisco capability models as starting point, the acquisition team investigated the practice of VS according to the Cisco template for due diligence. Capability heatmaps indicting areas that needed particular attention were developed. These heatmaps indicated areas in Cisco's capability models, where it would matter if VS deviated. In many areas, for example marketing, supply chain management and financial control, deviation or not would not be important as differences would not threaten value creation. But for VS, one area were differences could matter was in the consumption model, as Cisco saw integration of offering as the most critical value enabler. Here, a difference was noted by the acquisition team in how VS provided their offering to customers compared to the existing practice in the video solutions business area. Whereas Cisco's pre-existing video solutions used partners to sell their services, VS had direct relations with the clients, the service providers that offer stream media. Now, EA was engaged to see if this would consist a roadblock to integration, developing a capability model for VS in this particular area. Specifically, the pair of business and technology architects responsible for Cisco's capability models in the same area was tasked with the work. In the VS acquisition, it was possible to obtain enough information to sketch out the workings of the VS consumption model and to verify that it would be possible to support it with pre-existing operational, systems and technical capabilities. Because EA could rapidly assure the acquisition team that Cisco already provided the capabilities to support this second way of consuming software, the issue was removed

from the list of acquisition risks. In fact, the second consumption model was instead seen as an opportunity for reversed integration, where the rest of the video solutions business could learn how to reach customers without partners. It was, however, decided to keep the business view independent initially and mobilizing Cisco pre-acquisition capabilities in the operating, systems and technology views to enable the dual mode business approach.

Based on the dual business approach framing, likely to-be scenario was developed as a high level capability model. In all unknown areas of VS, the EA team worked with standard reference models as assumptions for the workings of VS. EA was then given the task of investigating potential internal development conflicts, with regards to the changes needed to archive the to-be scenario. It turned out the much of the affected systems capabilities were addressing the same capabilities as a soon to be started infrastructure project in which Cisco was implementing a new network target architecture. This was discovered by EA when updating the capability roadmaps for the network area. Therefore, at this stage it was decided to delay the not so time critical operational integration of VS and work the required capability changes into the major infrastructure project. This delayed the acquisition integration timeline, but synchronization of development lowered development cost associated with capability transformation. The decision to delay was a decision to prioritize one organizational change in front of another.

In the integration of VS, the focus on speed to orderability in the acquisition led to an initial focus on realizing the integration of independent consumption models. First of all, the to-be state scenario with two different consumption models was further detailed. This time, the rapid assessment had been correct and assumptions made in the due diligence held in this area. Second, the transformation needed to be able to cross-sell within the two independently running units was enabled by providing Cisco's partners the opportunity to offer also VideoGuard as a component of the VideoScape solution. VideoGuard was thus offered through two consumption models. EA updated the reference architecture to mirror these transformations. Only when the sales integration was completed, Cisco turned to the other business capabilities of VS to consolidate in search for cost synergies. This started with the organizational design, in which detailed plans were developed for how to move people and assets (including, for example, customer and financial data) across the former organizational boundaries to be absorbed into Cisco's corresponding functions. People were generally moved in teams to perform the tasks they were pre-acquisition doing, but in a new context. For example, the people in VS' marketing function remained in charge of marketing VS products, but were post-acquisition organizational a part of the video solutions business unit. Subsequently, EA investigated the IT enablement of the absorbed operations. Marginal adjustments were needed to systems and technical capabilities to support the added operations. For example, a minor extension of a product database and an extension of the technical infrastructure to support the

former VS offices. EA worked these transformations into the capability roadmaps for affected capabilities.

At this stage, Cisco discovered one issue and one opportunity that affected the integration schedule. First, Cisco encountered unexpected issues with the offering integration. It turned out that VS to a higher degree then expected were providing their customers with customized solutions. In fact, VS manufactured on demand and tailored products to each customer. This caused much discussion in Cisco about what to do with the deviation. One option was to keep the on demand customized development of VS and it was even discussed if this could be a potential way of working for the whole video services area. In the end, Cisco saw no long-term profitability in this mode of operation, and used the extended integration time to rework the offering development to a standard offer that to a lesser extend could be customized for the clients. In the process, VS lost some customers that could not be supported by the standard solution. However, among the remaining customers satisfaction grew rapidly, as the standard offering could be better maintained and updated, and profit margin was improved. Second, it was discovered that VS had as part of its offering a security solutions that were outperforming some of Cisco's own solutions. Consequently, this feature was technically and organizationally carved out from the VS offering and made available as a feature of Cisco's other products as a basic business service.

In the post-acquisition management phase, the EA team started with verifying that the changes to the to-be scenario that were made during the integration phase also had been implemented in the reference model. Then EA made a screening of the health metrics associated with the areas affected. No major issues were found. Then the acquisition team compared the initial capability models, heatmaps, and roadmaps with the post-integration state. They found that despite the challenges during the integration phase, time to orderability, the most critical part of the integration had been achieved. Because of the postponed integration, cost synergies were only fully effective 18 months after the acquisition. Reflecting on the differences in estimated and actual to-be state, the acquisition team noted two major differences. The first was the issues with the customized manufacturing of VS. Here, the acquisition team decided to updated their standard acquisition practice to cover also the possibility that the target would offering highly customized solutions. The item was included in the initial screening questionnaire. The member of the acquisition team from EA was assigned the task of investigating this matter in future acquisitions and, if needed, and to call on the rest of the EA function to investigate what it would mean for targets customers to move from tailored to standardized solutions. Although Cisco's EA function should be primarily internally faced, it was given this task as EA was considered the Cisco department that best would understand how changes in the technical enablement would affect the business of the target's customers.

The other deviation from the foreseen to-be scenario was the security feature that had been reversed integrated and spread throughout Cisco. This led to a minor adjustment in the acquisition practice. Scanning for reversed integration potential was already a task in due diligence. Discussions was whether to increase the focus on this aspect in due diligence. The decision was made not to. The option already existed when the acquisition team thought it would affect the decision to buy or not. However, it was made part of the standard practice that the member of the acquisition team from EA should actively investigate the potential for reverse integration in the time period between acquisition announcement and deal close, in order to establish which target capabilities that were candidates for preservation before the real integration work begun.

Table 3. Cisco's use of its Enterprise Architecture capability in the VS acquisition

Engagement	**EA role in VS acquisition**
Pre-acquisition preparation	
1a - Infrastructure preparation	At the time of the VS acquisition, the IT infrastructure was technically prepared (simplified and scalable) to support extended use and integration with additional IT Services acquired together with VS.
1b – Documentation	Up until the VS acquisition, the EA function kept an updated reference model of the IT architectures. Because of the existing documentation, at the start of the VS acquisition, the transformation team could 'hit the ground running', avoiding the need to first document the Cisco As-Is scenario.
1c – Knowledge integration	Understanding how the business and operational capabilities interact with systems and technical capabilities in areas such as consumption models helped the EA team to identify areas of concern prior to the integration and helped Cisco to later plan extra efforts in those areas.
Selection	
2a - Business case estimation	EA artifacts helped to determine the business and operational capabilities in place that would support the new business models being acquired. They were also used to determine which elements of the acquisition would be integrated wholly and which would remain stand-alone. In the case of VS it was decided to preserve the business capabilities while absorbing the operating, systems and technology capabilities.
2b – Roadblock analysis	The VS case presented a possible roadblock to the integration in that the way VS sold its products directly to end customers that was different than the partner channel approach Cisco utilized in the video solutions area. However, the EA team verified that it was possible to retain separate business capabilities, while still redeploying Cisco's existing operational, systems and technical capabilities.
2c – Transformation need assessment	By understanding the transformation needed to integrate the desired elements of VS the EA team were able to define programs with estimates across all four views needed to complete the integration and account for conflicting developments in the affected capabilities.
2d – Reversed integration potential	EA was tasked with examining the consumption models of the VS, identifying if there was opportunities for reversed redeployment of this capability.
2e - Suite analysis	EA was asked to evaluate the potential product integration issues and opportunities from the point of view of a customer. No such issues were identified.
Integration	

3a - To be state definition	Cisco's EA team played a role in mapping the current technical capabilities of both the acquired and acquiring entity and presented a target state of the integration.
3b - Organizational design	The acquisition team utilized the reference models to determine the conceptual integration of the workforce into the Cisco workforce model.
3c - IT enablement	The technology models contained in the reference model were used to determine the needed transformation to support the systems and operational capabilities needed to support the VS business capabilities.
3d – Roadmap development	The EA team leveraged a the To-Be scenario capability maps and transformation needs assessment to model required changes to each capability that required transformation and incorporate the changes required into capability roadmaps for the coming 18 months.
Post-integration management	
4a – Integration evaluation	Based on its ability to overview the acquisition transformation, EA was tasked with determine the extent to which the three key integration measurements had been achieved in the stipulated time frame.
4b - Integration correction	The EA team was tasked with documenting deviations from the integration plan in the reference model and to plan for corrective action to restore 'integration debt' caused during the acquisition process.

6 Discussion: Engaging the Enterprise Architecture function in Acquisitions

The EA capability enables Cisco to enhance its acquisition process through the lens of its business and operations capabilities, systems and technologies. This allows the acquisition team to plan, execute and evaluate acquisitions within a strategic planning framework that improves acquisition performance without compromising organizational performance. Specifically, using the EA capability improves acquisition performance through:

- **Speed (time to capability):** the reuse of the current capabilities in-house at Cisco allows the company to get its products, services and solutions faster to market and orderable.
- **Reduced integration cost (reuse):** the ability to support the integration of new business models and technologies with current operational capabilities, eliminating the need for redundant capabilities.
- **Reverse integration:** the ability to identify business or operational capabilities in the target company that can be scaled inside Cisco.

Long-term organizational performance and sustainability of the acquisition program is impacted through:

- **Reduced IT complexity**: through the ongoing documentation of the current state of the enterprise, redundant and unused assets are identified and made obsolete, sustaining a flexible organization.

- **Fewer simultaneous projects**: the rapid integration process means that Cisco can avoid the additional challenge from running a large number of acquisition integration processes in parallel.
- **Synchronization with other transformation initiatives**: The EA team orchestrates parallel integration processes with other transformative initiatives, enabling the firm to evolve as a coherent whole.

Two different forms of contribution of the EA capability to the acquisition are presented in Table 1: *direct* and *indirect*. The *direct* engagement refers to the specific tasks the EA team was engaged to perform in the acquisition project, forming an integrated constituent of the acquisition capability. The *indirect* engagement refers to when tasks in the acquisition project were facilitated by input delivered by EA[19]. The relationship between the EA team and the acquisition team was 'output-input', with EA providing artifacts that facilitated the work of the acquisition team (Figure 6). As explained further below, the distinction of modes of engagement is important as each mode entails different requirements from the EA capability and different managerial efforts to succeed in the engagement.

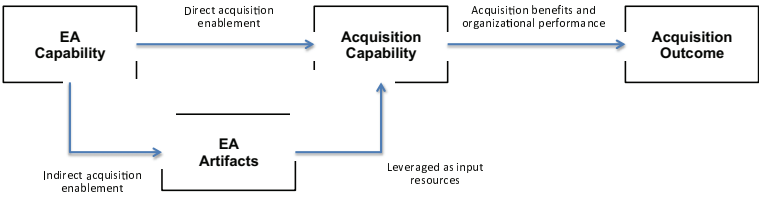

Figure 6. Contribution of the EA capability on acquisition outcome

The EA team also was assigned responsibility for a set of tasks in the acquisition project (see Figure 7). This *direct* engagement in the acquisition process was because the EA team was considered the best-positioned group within Cisco to analyze the actual implementation of the combined organizations and identify possible difficulties. Therefore, the tasks assigned to the EA team were

[19] For further information on task interdependence, see, for example, Thompson, J. D. (1967). *Organizations in Action: Social Science Bases of Administrative Theory*. Edison, NJ: Transaction Publishers.

typically associated with the design of operational, systems and technical capabilities that would support the envisioned business scenario to the extent this was possible and most effective path of migration.

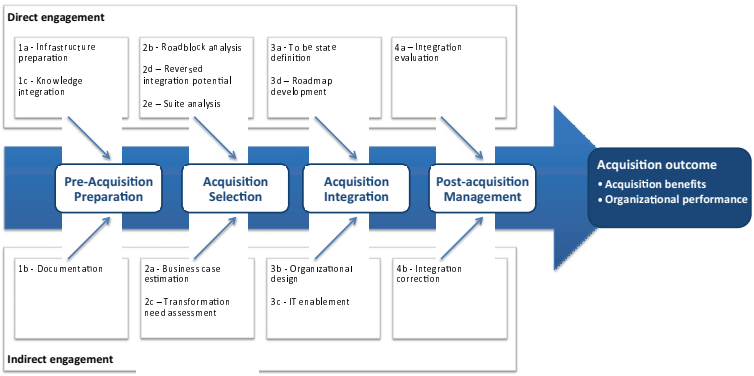

Figure 7. In situ and ex situ engagement of the EA function in the acquisition process

In addition to the active engagement where the EA team was assigned responsibility for tasks in the acquisition project, EA also contributed to the acquisition process by provision of resources used by the acquisition team in a number of tasks (see Figure 6). In these tasks, members of the acquisition team used the enterprise reference model (task 1b, 1d, 3b and 3c), capability heatmaps (task 2a, 2c) and the enterprise architecture health metrics dashboard (4b) to guide work. Commonly, within these activities members of the acquisition team needed the means to express visions for how they wanted the organization to work post-acquisition. These tasks were mainly situated in the business level of the BOST framework. Designing the future business strategy was not considered a role for the EA team, but the EA artifacts were found useful to envision possible strategies. The role of the EA team in these tasks was to assist members of the acquisition team to find, understand and harness the information available in EA artifacts.

The two modes of engaging EA in the acquisition process put fundamentally different requirements on the EA capability. First, the *indirect* engagement corresponds well to the description purpose of EA. The description purpose, relative to the design and evaluation purpose, represents a relatively basic use of EA. We argue that most organizations with an EA capability would start with the description of enterprise capabilities. Therefore, it is likely that most organizations actively

pursuing EA would have an EA team that could fulfill the demands of the *indirect* engagement of EA.

However, the *indirect* engagement of EA within Cisco's acquisition process required that members of the acquisition team, must be able to understand and express ideas about the future business strategy in terms of capability maps. In a large acquisition, the acquisition team would involve high-level general managers. In Cisco, managers held this critical capacity to communicate business strategy in terms of capability maps. Without their understanding of the EA approach to business modeling, there would have been limited use even if the EA team maintained an updated enterprise reference model.

Second, the *direct* engagement evident at Cisco corresponds well to the design and evaluation purposes of EA. To be able to complete these purposes, the EA team needs a profound understanding of not only the technical aspect of EA but also of the business strategic objectives that the firm seeks to achieve. Without such understanding, the EA team cannot be given the responsibility to complete tasks such as investigating the potential of reverse integration, to-be state definition, and progression analysis (Figure 3).

Our experiences from working with EA in various organizations is that typically, EA is primarily a technical concern. In most firms, the EA team would not possess the necessary critical business knowledge and therefore would not be able to contribute to the acquisition process through *in situ* engagement. At Cisco, however, the reformation of EA in 2006 explicitly aimed to build a business strategy competence in the EA team through defining enterprise architect roles with responsibility for business and operations architectures. Through the establishment of 'EA dyads' where technical and business architects worked in pairs, Cisco over time evolved an EA team that transcended technological and business domains, enabling *direct* engagement in the acquisition process.

7 Lessons learned

Five key lessons for how to succeed with EA in preparation, selection, integration and post-integration management of acquisitions were distilled from Cisco's use of EA in its acquisition-based growth strategy and from the Video Solutions case study. The first lesson applies generally to all phases, as a mode of operating an EA capability. The other four lessons learned map to each of the four phases in Cisco's acquisition process. .

7.1 Lesson 1: Approach EA as an ongoing Enterprise Architecting *activity*

An EA capability performs the "ongoing process of discovery" of an organization about its current and future business, operations, systems and technology. The enterprise reference model will never comprise a complete representation of the company's capabilities. The critical task in relation to acquisitions is to ensure that it is as correct as needed, in the areas that are needed, and at the time needed. The architecture is never complete and the emphasis is on "architecting" rather than "architecture". This differs from the more traditional view of EA as a complete and accurate representation of a company.

EA in acquisition does not imply that an EA is developed for the target company and then compared with the acquirer's EA, nor is an EA for the target company essential during the acquisition process. At the beginning of the acquisition process, the acquiring firm does not know anything about the target firm's EA. Developing a complete enterprise reference model for the target firm according to the reference framework used by the acquirer would be virtually impossible and at the least not feasible given the need for a rapid integration process. Therefore, the understanding of the target firm's EA needs to be built progressively over time.

Acquiring VS, Cisco progressively discovered the EA of VS. Initially focusing on areas where deviations from the expected would matter, the EA team enabled drilling down to assess if the technical integration would present obstacles. After deal closure, the discovery process continued in the integration phase, revealing more details about the acquired company and adjusting expectations about target state architecture. Finally, the extent to which the desirable to-be scenario had been possible to reach was evaluated.

Understanding where in a target it is necessary to focus modeling and to 'dig deeper' is a constant learning process, also for Cisco. In the VS acquisition, Cisco caught some critical areas but missed some important areas where further modeling would have been needed. Fueling this learning practice, Cisco use each acquisition as an opportunity to refine its 'just in time' modeling approach, to capture critical aspects of the targets EA before closing a deal. This lesson of 'just in time' thinking might be even more crucial for other companies where EA efforts are extensive and in many cases rarely used during the execution of strategy.

7.2 Lesson 2: Investing in EA helps an organization to be acquisition ready

To be acquisition ready (Phase 1 of the acquisition process model), organisations can invest in EA resources. These include people with EA, business and technology knowledge and skills; a framework like the BOST framework that defines how business models link to and integrate with technology models; and a set of EA models. An EA capability contributes towards the preparation

for acquisitions by ensuring that the IT infrastructure is scalable, documentation is in place as a starting point, and that the link between business capabilities and technical enablement is well understood. Being acquisition ready enables acquisition projects to proceed more quickly and with more certainty.

At Cisco, the advantage of an EA capability to make the acquirer acquisition ready was illustrated with the work with software consumption models. After a stream of acquisitions, Cisco provided 32 different ways for customers to purchase software, technically enabled by the IT department as well as external sourcing providers and as 'shadow IT' hosted locally. With every acquisition, a new consumption model was typically bolted on. Standardizing on business, operational, system and technological capabilities for software consumption, Cisco reduced the software consumption models to four. These four models were enabled by scalable operational, systems and technical capabilities, well documented and well understood by the business and technology architects with designated responsibility for the area. Within the VS case study, the work within Cisco in defining four standard software consumption models, illustrates how EA can simplify and streamline the acquisition process.

7.3 Lesson 2: EA can be a business capability modeling and road-mapping function

The challenge of the selection phase (Phase 2 of the acquisition process model) is to envision how the combined organization should work, and to identify potential roadblocks for this vision. EA can assist in this regard, if the acquirer embraces EA as a business modeling approach. Business capability models, capability heatmaps and capability roadmaps can be used to capture the critical value creation of the acquisition and to drill down into the operational, systems and technical integration required to leverage value potential. The business capability models are included within the BOST framework at the "B" level and links to associated O, S and T models enable checking which business capabilities are supported by operational, systems and technical capabilities. The EA tools used to govern transformational actions, such as capability heatmaps and roadmaps are critical in achieving due diligence during acquisition selection.

Many companies use EA with a sole focus, or at least emphasis, on the technical side of EA. There is synergistic value in using EA for both business and technology modeling. Advantages include (a) clear and direct channels to drill down through during the due diligence phase, as for each business capabilities there is within Cisco documentation of the enabling operation, systems and technical capabilities and the an established knowledge of the capacities of these capabilities, and (b) faster and more direct translation from business to-be scenario to integration plans in the transition from due diligence to integration phase, compared to if a business model showcasing acquisition value potential should be "translated" to a technically capability model, and (c) over time knowledge

about how a business capability is technically enabled is accumulated in the EA-pairs that are working with certain BOST capability constellations.

In Cisco, capability maps were used by the acquisition team to envision and communicate the to-be scenario of the acquisition. Consistent with the dynamic discovery of the target's EA, capability heatmaps and roadmaps were used to focus architecting activities solely on the areas of the enterprise that were critical to value creation. In the VS acquisition, software consumption was such an area, where a business and technology architect worked with the acquisition team to investigate the possibilities of integrating the VS software consumption model with the models provided by Cisco, and if there was any roadblocks associated with this integration.

7.4 Lesson 4: EA enables synchronization with other organizational transformations

With the view that EA is an approach to support an ongoing transformation of the company, using EA in the integration phase (phase 3 in the process model) enabled Cisco to make acquisition integration synchronized with other transformation initiatives. EA works with capability roadmaps that cover the intended transformation for a specific capability with an 18 month horizon. Synchronizing the acquisition integration with ongoing or future organizational transformations makes a more efficient integration phase, because less work has to be done again, and the business disruptive effects of organizational transformation can be kept to a minimum.

To succeed with synchronization of acquisition integration and the ongoing transformation of the company it is essential with a holistic understanding of the different technological and organizational transformations that a company are facing in the near future, and to what extent they are overlapping. This critical overview of the ongoing technical transformations and what part of the organization it affects can be provided by an EA function that spans both the business and technology domains of the organization.

In Cisco, relating the integration of VS to the organizational transformation enabled Cisco to synchronize the integration with a major infrastructure project. This had a number of benefits. First, re-doing of integration work after the infrastructure project was avoided. Second, the major integration project was marginally adjusted to consider the scheduled integration with VS. Third, for VS it meant that the business unit only needed to go through one disruptive organizational change. These benefits outweighed the cost of delaying systems and technical integration of VS.

7.5 Lesson 5: Use the digital trace of EA to evaluate and learn

The outcomes of acquisition projects need to be measured, particularly after the integration phase has been completed (Phase 4 of the acquisition process model). Using EA in the preparation, selection and integration of acquisition has the additional merit of producing rich documentation for how acquisition and integration proceeds. Such 'digital traces' includes the pre-acquisitions reference models that can be used to evaluate how the acquisition has impacted the IT infrastructure. The EA health Dashboard displays relevant metrics to business and EA stakeholders. Post-acquisition evaluation can also revisit the to-be scenario created in the due diligence phase and compare it to the actual post-acquisition capability models, to investigate how accurate initial assessment was. Finally, capability roadmaps can be used to back trace how changes was made to understand when and how changes to the business, operational, systems and capabilities were made if the root causes to some problems need to be identified. This enables analysis of acquisition projects to ensure that Cisco is ready for the next acquisition, and can learn from completed acquisition projects. Furthermore, any deviations from expected outcomes can be identified and actions taken to restore the quality of IT infrastructure.

After the VS acquisition, the acquisition team used documentation provided by EA to evaluate the performance of the acquisition. In particular, the evaluation contrasted forecasted and actual integration outcomes to fuel an ongoing learning process on what needs attention in the due diligence of an acquisition. This led to a revision in due diligence, with increased emphasis on investigating how an offering was technically delivered to the targets customers and the additional task assigned to EA to investigate scheduling barriers in larger acquisitions. Therefore, in subsequent acquisitions Cisco could recognize these possible obstacles in the selection of an acquisition target.

8 Concluding comments

Acquisitions of other business units is a common, but challenging, component of many firm's corporate growth strategies. Drawing on an advanced EA capability in the acquisition process can improve possibilities for value creating acquisitions. If the purpose of EA in an organization is to enable the translation of strategic initiatives, based on a corporate vision, into executable components that can be measured and operated, then there is a high likelihood that it can have a meaningful impact on the ability for the organization to remain agile, responsive and adaptive to a changing business environment. The key is to focus efforts on major business transformations and to develop models that enable rapid and agile acquisition processes that translate strategy into execution 'just in time'.

9 Methodological note

Empirical data for this article was obtained partly from first hand experiences with Cisco's EA practice, where one of the authors is employed as Head of Enterprise Architecture. Personal experiences were complemented with 22 in-depth interviews with Cisco managers and employees involved in the firm's acquisitions to understand the role of EA in the acquisition process. Interview subjects ranged from the Chief Executive Officer (CEO) to line managers and technical integrators. Public material (press releases, generic integration model, etc.) and internal documentation (target assessments, integration plans, performance evaluations, etc.) of Cisco's acquisitions contributed data points for triangulation of findings and confirmation of acquisition details.